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Graeme B. Smith

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On some Silverfish Taxa from Tasmania (Zygentoma: Lepismatidae and Nicoletiidae)

GRAEME B. SMITH

Research Associate, Australian Museum Research Institute,
1 William Street, Sydney New South Wales 2010, Australia

Federation University Australia,
PO Box 663, Ballarat Victoria 3353, Australia
le_gbsmith@optusnet.com.au

ABSTRACT. The silverfish fauna of Tasmania is reviewed. Seven species are now recorded, including the introduced anthropophilic *Ctenolepisma longicaudata* Escherich. Within the Ctenolepismatinae *Hemitelsella clarksonorum* n.gen., n.sp. and *Acrotelsella parlevar* n.sp. are described. The Heterolepismatinae are represented by an unconfirmed record of *Heterolepisma kraepelini* Silvestri and *Heterolepisma buntonorum* n.sp. is described. The inquiline Atelurinae are represented by *Australiatelura tasmanica* Silvestri, which is redescribed, and a further sympatric species, *Australiatelura eugenanae* n.sp., is described.

KEYWORDS. Thysanura, taxonomy, new species, new genus, new combination, redescription, *Australiatelura*, *Hemitelsella*, *Heterolepisma*, *Acrotelsella*

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The Tasmanian silverfish fauna is poorly known. Womersley (1939) reported *Heterolepisma kraepelini* Silvestri, 1908 (originally described from Western Australia) at Trevallyn and commented that *Ctenolepisma longicaudata* Escherich, 1905 is "very common in houses and libraries everywhere in Australia". Silvestri (1949) described *Atopatelura tasmanica* from material collected by Lea with the ants *Camponotus (Colobopsis) gasseri* Forel, 1894 and *Camponotus nigriceps* Smith, 1858. Mendes (1995) transferred *At. tasmanica* to a new genus *Australiatelura* which he erected to include the Tasmanian species as well as the three species described from Western Australian by Silvestri in 1908.

This paper will redescribe *Au. tasmanica* (Silvestri) using the type material along with specimens collected in and around the type locality (Hobart) while also referring to specimens collected along the Tasmanian east coast. An additional sympatric species of *Australiatelura* is also described, along with three new species of Lepismatidae. One belongs to the genus *Heterolepisma* Silvestri, 1935 (Heterolepismatinae) which appears to be quite common under the bark of trees and in dry leaf litter in the south-east. Two new species of Ctenolepismatinae are described; each only known from a single specimen, collected together in a single pitfall trap south of Launceston. One belongs to the genus *Acrotelsella* Escherich, 1905 not previously found so far south and the second placed in a new genus described in this paper. The nearest relative of this latter species was only recently described from Barrow Island (Smith, 2015) and was then placed within *Acrotelsella* with some reservation. The finding of a second species reinforces the need for a new genus to be erected. Two additional records of the cosmopolitan anthropophilic species *Ctenolepisma longicaudata* Escherich, 1905 are listed.

Materials and methods

Most specimens referred to in the description are deposited in the entomological collection of the Australian Museum, Sydney (AMS) and have been allocated museum database numbers with prefix "K" in the lists of material examined. A few specimens (indicated in the list of material examined) were borrowed from the Australian National Insect Collection, Canberra (ANIC) and some voucher specimens have been deposited with the Tasmanian Museum and Art Gallery, Hobart (TMAG). The types of *Australiatelura tasmanica* Silvestri were borrowed from the Museo di Entomologia "Filippo Silvestri", Università degli Studi di Napoli Federico II, Portici, Italy (a unique centre within the museums of the Dipartimento di Agraria; previously the Instituto di Entomologia Agraria, Portici) (MUSA). No single specimen among Silvestri's material allowed all characters to be adequately described so no lectotype has been designated. To facilitate its identification within this paper, each of Silvestri's specimens has been allocated a number from the current author's database (e.g., gbs001868), a copy of which is held in the Australian Museum Archives.

Locality co-ordinates for specimens collected by the author, were made using a hand held Garmin eTrex®10 GPS with accuracy to c. 5 m. All specimens are stored in 75–80% ethanol unless noted as slide mounted. Shortly after collection, a leg was removed from some specimens and placed in 100% ethanol and stored at 4°C for possible DNA sequencing. Climate data was obtained from the Australian Bureau of Meteorology website (BOM, 2016).

Measurement data of whole specimens in alcohol and dissection methods used are as described in Smith (2013). Head widths of Silvestri's slide mounted material cannot be directly compared with head width of whole specimens. In most cases, dissected specimens were each mounted on two slides using Tendeiro medium, with the head and thorax mounted on one slide and the abdomen on a second slide. Roman numerals are used to indicate abdominal segment number. The following abbreviations are also used: *asl*: above sea level (in metres); *HW*: head width (in millimetres); *H+B*: head and body length (in millimetres); *L/W*: length to width (ratio); *NSW*: New South Wales; *PI, PII, PIII*: legs of pro-, meso- and metathorax respectively; *TAS*: Tasmania; *SA*: South Australia; *VIC*: Victoria; *WA*: Western Australia.

The term *macrochaetae* refers to the larger stronger bristles, *setae* refers to smaller thinner bristles (usually simple), *setulae* to the very small, usually straight, setae and *cilia* to the curly thin hairs, often associated with the combs, setal collar or notal margins. In the case of the Atelurinae, the term *abiesiform* is used to describe the dorsal submarginal macrochaetae as defined in Smith & McRae (2014). Left and right refer to the animal when the dorsal surface is observed with the head forward. Terminology for the "segments" of the antennae, terminal filaments and ovipositor follows Smith (2015), where the term *annulus* will be used for each single unit of the flagellum (excluding pedicel and scape), usually a widened region carrying a single rosette of setae (but occasionally with a smaller secondary rosette), *T-annulus* for each annulus bearing a trichobothrium, *interval* for the group of annuli between T-annuli with the T-annulus being the most distal annulus of the interval. An interval may be divided into two groups of annuli, each of which will be referred to as a *chain*. For the terminal filaments and ovipositor, the term *division* will be used for each "segment" defined by a visible suture, albeit often faint.

Specimens used for scanning electron microscopy (SEM) were put through an ethanol dehydration series then critical point dried using a Leica EMCPD300. They were mounted on a pin or on a double-sided carbon tab stub and gold sputter-coated using an Emitech K550 Gold Sputter-coater. Specimens were imaged using either a Philips 505 with a backscatter electron detector or a Zeiss EVO LS15 SEM with a Robinson backscatter detector.

Systematics

Family Nicoletiidae (Lubbock, 1873)

Subfamily Atelurinae Remington, 1954

Tribe Atopatelurini Mendes, 2012

Australiatelura Mendes, 1995

Atopatelura Silvestri, 1908a: 369 *pro parte*.
Australiatelura Mendes, 1995: 98.

Type species: *Atopatelura kraepelini* Silvestri, 1908 (original designation).

Australiatelura tasmanica (Silvestri, 1949)

Figs 1–41

Atopatelura tasmanica Silvestri, 1949: 35.
Australiatelura tasmanica (Silvestri).—Mendes, 1995: 98.

Type material. Paratypes (all labelled as "cotypi!", no specimen apparently designated as "typus"; specimen labels only state "Tasmania" however Silvestri (1949) lists all material (3.5 mm in length) as collected in Hobart with the ant species *Colobopsis gasseri* F. or a larger variety (5 mm) collected with *Camponotus nigriceps* Smith. Being unaware at the time of the presence of a second sympatric *Australiatelura* species, this latter specimen was not specifically recognised among the material before they were returned to MUSA. Being larger than the typical *Australiatelura tasmanica*, it is possible that it could belong to another species, such as the second species of *Australiatelura* described in this paper. Paratypes (4♂♂, 4♀♀, 1 unsexed juvenile): ♂ (HW 0.71 measured from slide) (MUSA gbs001868 on single slide); ♂ (HW 0.89 measured from slide) (MUSA gbs001869 on single slide), nest of *Colobopsis gasseri* F.; ♀ (HW 0.95 measured from slide) (MUSA gbs001876); ♀(?) very small, poor condition, very shrivelled, not much distinguishable (MUSA gbs001882 in alcohol); juvenile, tiny, poor condition, very shrivelled, not much distinguishable (MUSA gbs001883 in alcohol), same tube as previous specimen; ♂ (HW 0.54) (MUSA gbs001884 in alcohol with three ants); ♂ HW 0.57 (MUSA gbs001885 in alcohol), same tube as previous specimen; ♀ (HW 0.64) (MUSA gbs001886 in alcohol with five unidentified ants); ♀ (HW 0.51) (MUSA gbs001887 in alcohol) same tube as previous specimen. All collected in Hobart, TAS by A. Lea.

Other topotypic (Hobart) material examined (6♂♂, 4♀♀, 1 unsexed juvenile): ♂ (HW 0.83) (K260976 K260977 on two slides) TAS: Hobart, Queens Domain, summit loop road, northern most point, 41°51'44.9"S 147°19'08.7"E, 1.vi.2011, S. Bunton, under stones with *Iridomyrmex* sp.; ♀ (HW 0.73) (K377702 in alcohol), same data as previous; ♂ (HW 0.73) (K261020, K261021 on two slides) same data as previous; juvenile ♀ (HW 0.53) (K377703 in alcohol), same data as previous; juvenile ♂ (HW 0.58) (K377705 in alcohol), same data as previous; juvenile ♀ (HW 0.58) (K377706 in alcohol), same data as previous; juvenile ♂ (HW 0.53) (K377707 in alcohol), same data as previous; ♂ (HW 0.73) (K261022, K261023 on two slides) TAS: Hobart, Queens Domain, northern end, 42.86246°S 147.31906°E, 141 m asl, 22.xii.2011, G. Smith and S. Bunton,

under stone; ♀ (HW 0.73) (K260974 K260975 on two slides) TAS: Hobart, Mt Stuart lookout, 42.87452°S 147.29564°E, 253 m asl, 22.xii.2011, G. Smith and S. Bunton, under stone with *Camponotus consobrinus* (Erichson, 1842); 1 juvenile (HW 0.55) (K377708 in alcohol), TAS: Hobart, Mt Nelson, near road, 42.91411°S 147.31437°E, 257 m asl, 22.xii.2011, G. Smith and S. Bunton, under stone with *Myrmecia fulviculis* Forel, 1913; ♂ (HW 0.78) (K261026, K261027 on two slides) TAS: Hobart, Mt Nelson, along fence line, 42.91371°S 147.31406°E, 269 m asl, 22.xii.2011, G. Smith and S. Bunton, under stone with "inchman" *Myrmecia esuriens* F. Smith, 1858; ♀ (HW 0.80) (K377709 in alcohol) same data as previous.

Other (non-Hobart) material examined (16♂♂, 6♀♀, 1 unsexed juvenile): juvenile ♀ (HW 0.50) (K377680 in alcohol) TAS: Friendly Beaches, at edge of beach, 41.991°S 148.287°E, 24.i.1987, G. Smith and L. Wheeler, with ants *Rhytidoponera tasmaniensis* Emery, 1911 and *Pheidole* sp.; juvenile (HW 0.50) missing end abdomen (K377681 in alcohol) same data as previous; ♀ (HW 0.69) (K377682 in alcohol) same data as previous; ♂ (HW 0.70) (K261018, K261019 on two slides) same data as previous; ♂ (HW 0.68) (TMAG F14807 in alcohol) same data as previous; juvenile ♂ (HW 0.54) (gbs001095 K377683 in alcohol) same data as previous; juvenile ♂ (HW 0.50) (K377684 in alcohol) same data as previous; juvenile ♂ (HW 0.50) (K377685 in alcohol) TAS: Friendly Beaches, 41°59'20.8"S 148°17'14.8"E, 31.v.2011, S. Bunton, with ants on edge of beach; juvenile ♀ (HW 0.50) (K377686 in alcohol) same data as previous; ♂ in two pieces, missing head (AMS K377710 in alcohol) TAS: Freycinet National Park, 24.i.1987, G. Smith and L. Wheeler, under stones; ♂ (HW 0.60) (AMS K377711 in alcohol), same data as previous; ♂ (HW 0.55) (K377687 in alcohol) TAS: Bicheno, 41°52'39.1"S 148°18'21.8"E, 30.v.2011, S. Bunton; juvenile (HW ca 0.50), (K377689 in alcohol) TAS: Friendly Beaches, 41°59'20.8"S 148°17'14.8"E, 31.v.2011, S. Bunton, same data as previous; juvenile ♂ (HW 0.50) (K377690 in alcohol) TAS: Bicheno, 41°52'39.1"S 148°18'21.8"E, 30.v.2011, S. Bunton; subadult ♂ (HW 0.56) (K377691 in alcohol) same data as previous; subadult ♂ (HW 0.55) (K377692 in alcohol) same data as previous; ♂ (HW 0.63) (K377694 in alcohol) Bicheno lookout, 41.87757°S 148.30612°E, 64 m asl, 19.xii.2011, G. Smith and S. Bunton, under granite stones with ants; ♂ (HW 0.70) (K261024, K261025 on two slides) same data as previous; ♂ (HW 0.68) (K377696 in alcohol) same data as previous; ♀ (HW 0.68) (K377697 in alcohol) same data as previous; ♀ (HW 0.50) (K377699 in alcohol) TAS: Friendly Beaches 41.98912°S 148.28746°E, near sea level, 20.xii.2011, G. Smith and S. Bunton, under stones on sandy soil with *Rhytidoponera victoriae* (André, 1896); juvenile ♂ (HW 0.50) (K377700 in alcohol) same data as previous; juvenile ♀ (HW 0.50) (K377701 in alcohol) same data as previous; ♂ (HW 0.60) (K260978 K260979 on two slides) TAS: Friendly Beaches 41.98912°S 148.28746°E, 20.xii.2011, G. Smith and S. Bunton, under stones close to beach with *Amblyopone australis* Erichson, 1842, *Rhytidoponera victoriae* (André, 1896) and *Pheidole* sp..

Diagnosis. This species is distinguished from *Australiatelura hartmeyeri* (Silvestri), the only other described species with fairly narrow subcylindrical paramera, by the relatively short abiesiform macrochaetae on the thoracic and abdominal terga (much longer in *Au. hartmeyeri*).

Redescription. *Appearance*. Pale gold/ochre colour when live (Fig. 1), becoming off-white in alcohol; lacking pigment. Ateluroid (tear-drop shape) tapering uniformly posteriorly, about 2½ times longer than wide (Fig. 2), head hypognathous (Fig. 3).

Body length. Small species, H+B 4.0 mm in largest specimen available, range of HW 0.53–0.83 mm; antennae up to just over one half H+B; cerci 0.14–0.21 H+B; median dorsal appendage only complete in one specimen (K261027) one third H+B.

Scales. Mostly rounded or pointed apically, multiradiate with about 11–23 rays, the rays on dorsal scales not or only slightly extending beyond the margins but on the urosternites distally free for about one tenth their length (Figs 4 and 5 respectively). Scales cover surface of all tergites and sternites (including the subgenital plate) and a few scales are present on the coxae of all legs; scales not present on the head and its appendages and the legs (except for a few on the coxae), the paramera, terminal filaments and ovipositor.

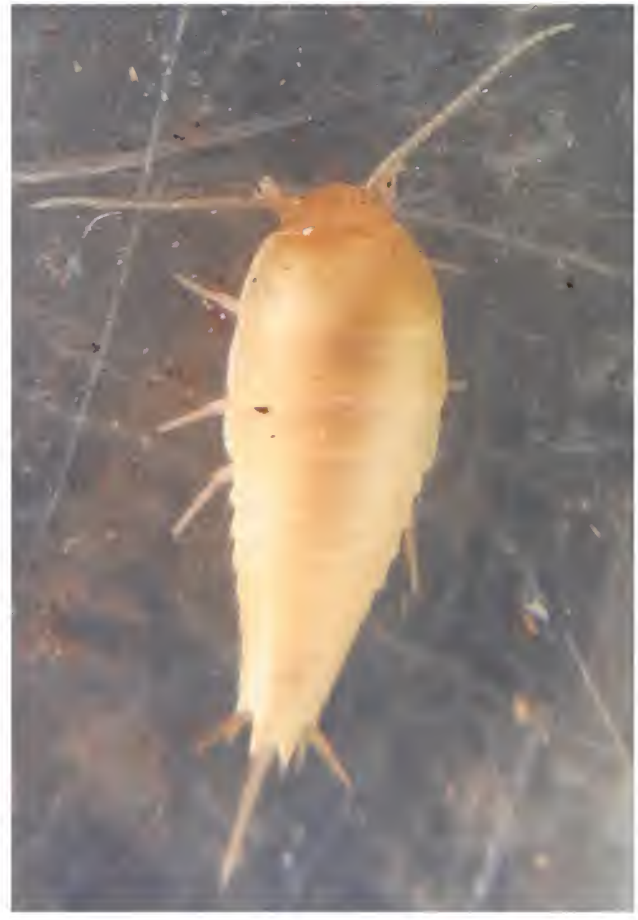
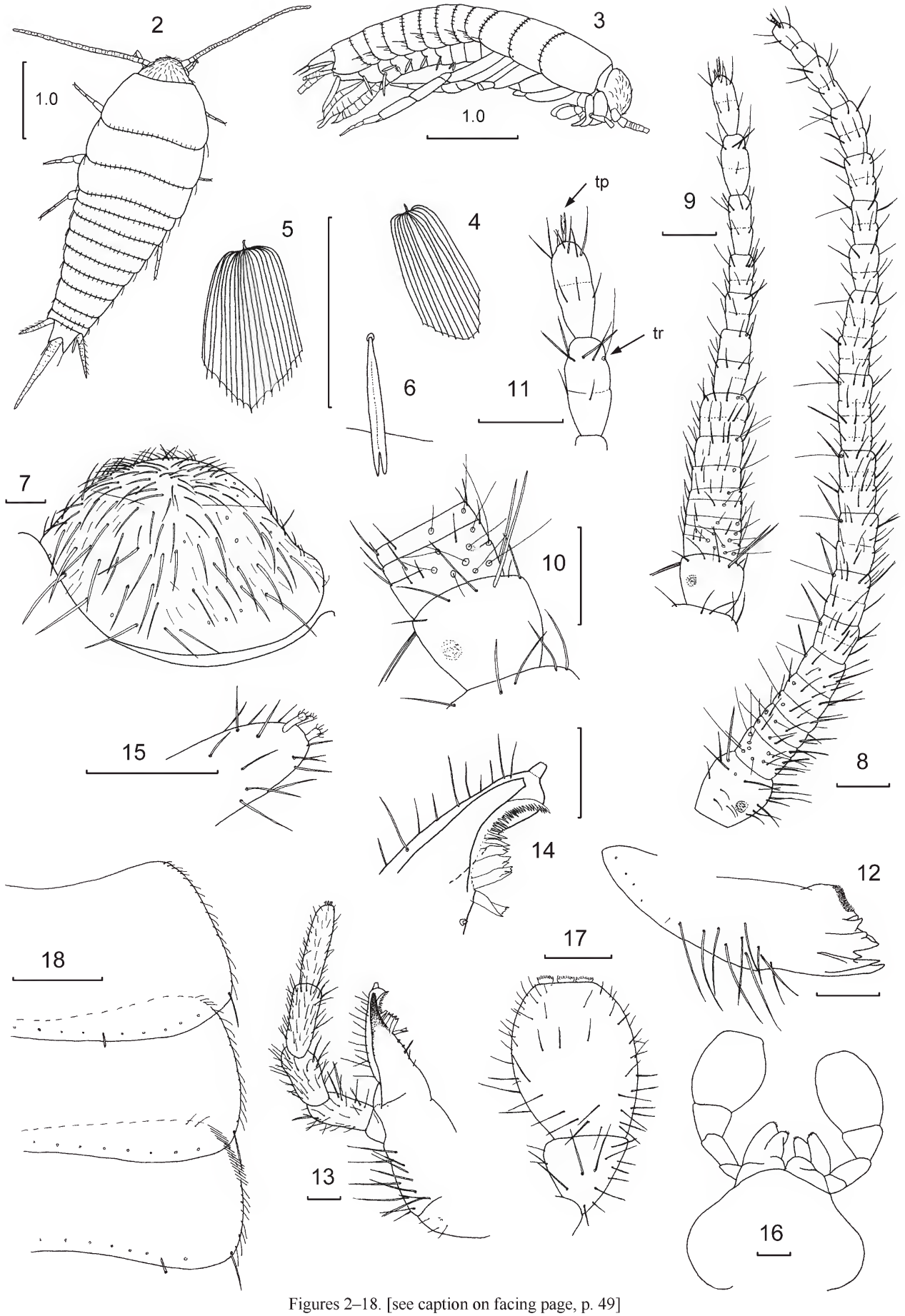


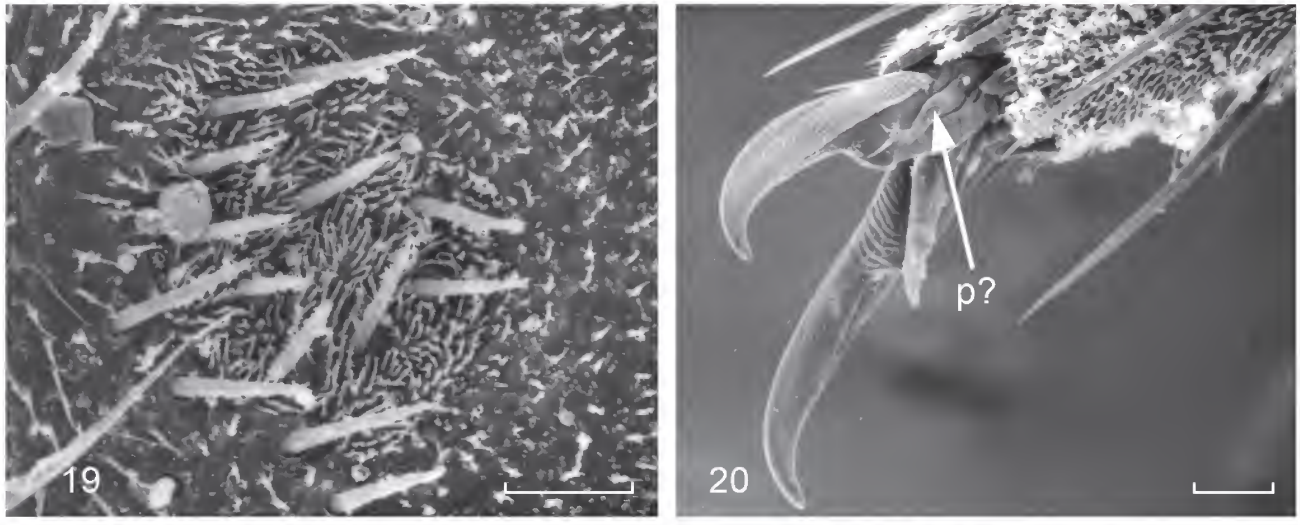
Figure 1. *Australiatelura tasmanica* (Silvestri), Mt Stuart, Hobart.

Macrochaetae. Macrochaetae simple or apically bifurcated, those along posterior margin of tergites abiesiform (Fig. 6), about 55–90 microns in length in larger specimens and, on average, 1.20 times the length of adjacent scales (range 0.86–1.53).

Head. More or less free, only slightly covered by prothorax at hind margin (possibly a preservation effect), vertex with scattered small, fine setae as well as long, fairly strong, minutely apically bifurcated setae arranged in four or five transverse, slightly irregular rows that become less distinct anteriorly where the setae become smaller and more numerous (Fig. 7). Antennae (Figs 8, 9) with 12 to 17 intervals in the flagellum; intervals/annuli from around the 6th to 9th begin to divide into two annuli, with the annuli becoming more distinct distally, and from the 10th to 13th interval the annuli further subdivide; scape with rosette of small setae apically, pedicel (Fig. 10) with an apical macrochaeta longer and stronger than other subapical setae and several shorter macrochaetae; pedicel of adult male with a shallow fovea with about 15 to 25 short setulae (Figs 10, 19) within or on the margins of the depression; first annulus/interval of flagellum with eight to ten trichobothria in a consistent pattern (see remarks regarding variability of antennae), subsequent intervals with two trichobothria until 8th to 13th and beyond which only a single subapical trichobothrium is present on the most distal annulus of



Figures 2–18. [see caption on facing page, p. 49]



Figures 19–20. *Australiatelura tasmanica* (Silvestri) ♂ Friendly Beaches. *(19)* fovea of ♂ pedicel; *(20)* pretarsus with possible pulvilla *(p?)*.

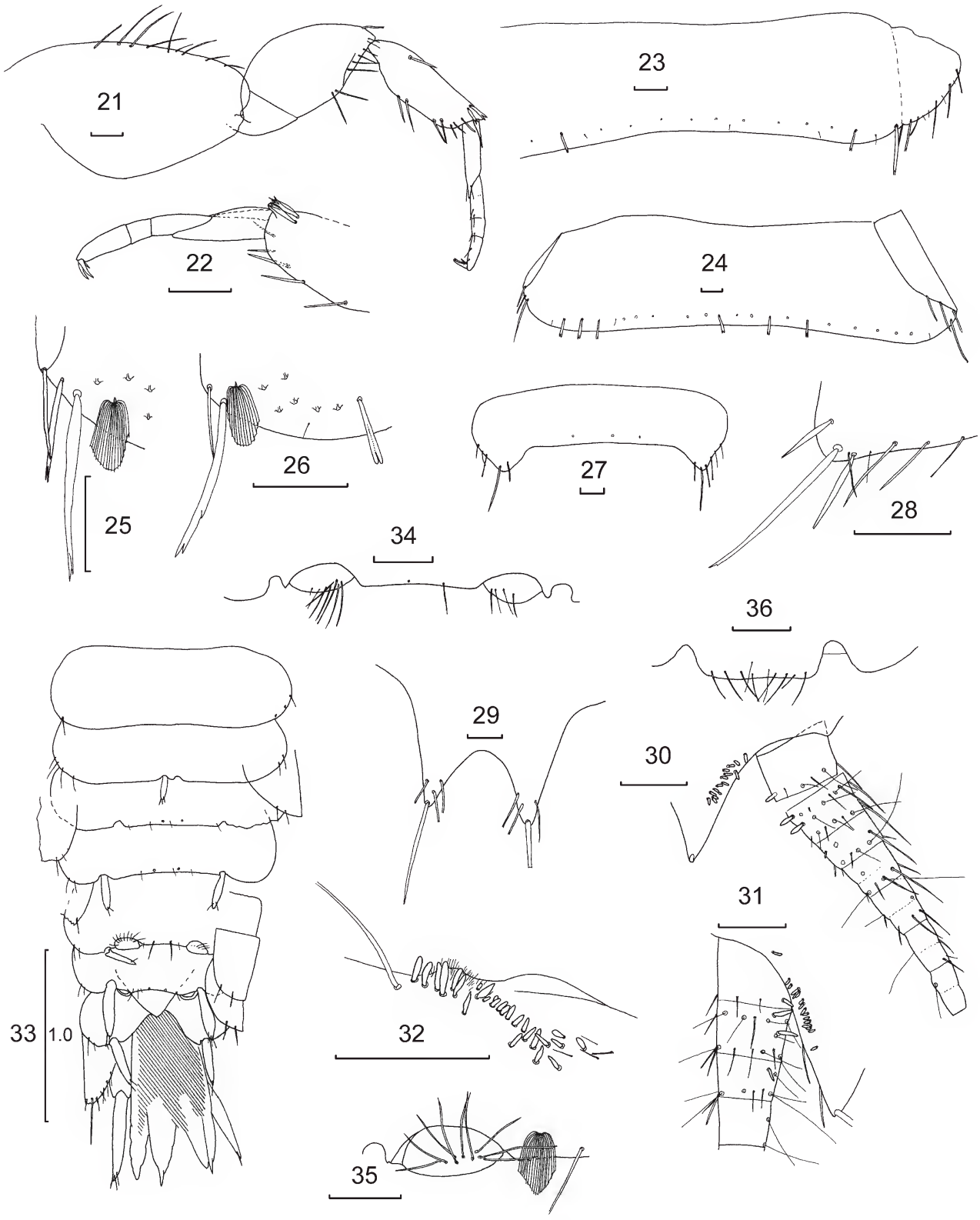
each interval, except on the ultimate annulus which has an terminal papilla (Fig. 11); the ultimate interval may have either two or four annuli. —Labrum with scattered setae, those proximal stronger than those distal. —Mandibles (Fig. 12) with well-developed incisor and molar regions. —Maxillae (Fig. 13) with lacinia about the same length as the galea (although the galea seems to be shrunken in the type material); lacinia with simple pointed apex, pectinate prostheca not or only slightly extending beyond apex of lacinia; galea with single prominent apical conule (Fig. 14). Maxillary palp stout, with two or three feathered papilla distally (Fig. 15); apical article four times longer than wide with sub-parallel sides (range 2.9–5.8) and 1.45 times longer (range 1.14–1.70) than penultimate article and only slightly thinner. Labium with widely rounded posterolateral margins (Fig. 16); ultimate article of palp (Fig. 17) truncated ovate about 1.63 times as long as wide (range 1.22–2.14) with six sensory papillae distally; remaining articles including base with several stronger, apically bifurcate setae.

Thorax. Large (Fig. 18), about 0.43 H+B (range 0.37–0.48), nota not completely enclosing the legs; submarginal posterior row of 19–24 subequally spaced, abiesiform macrochaetae with about ¼–⅓ their length overlapping the posterior margins of the tergites; lateral margins of nota with curved setae, the macrochaeta on each of the posterior angles of the nota about twice as long as the abiesiform setae; disc of nota with some scattered short, delicate setulae among the scales. Pronotum longer than each of the meso- and metanota but not as long as both together.

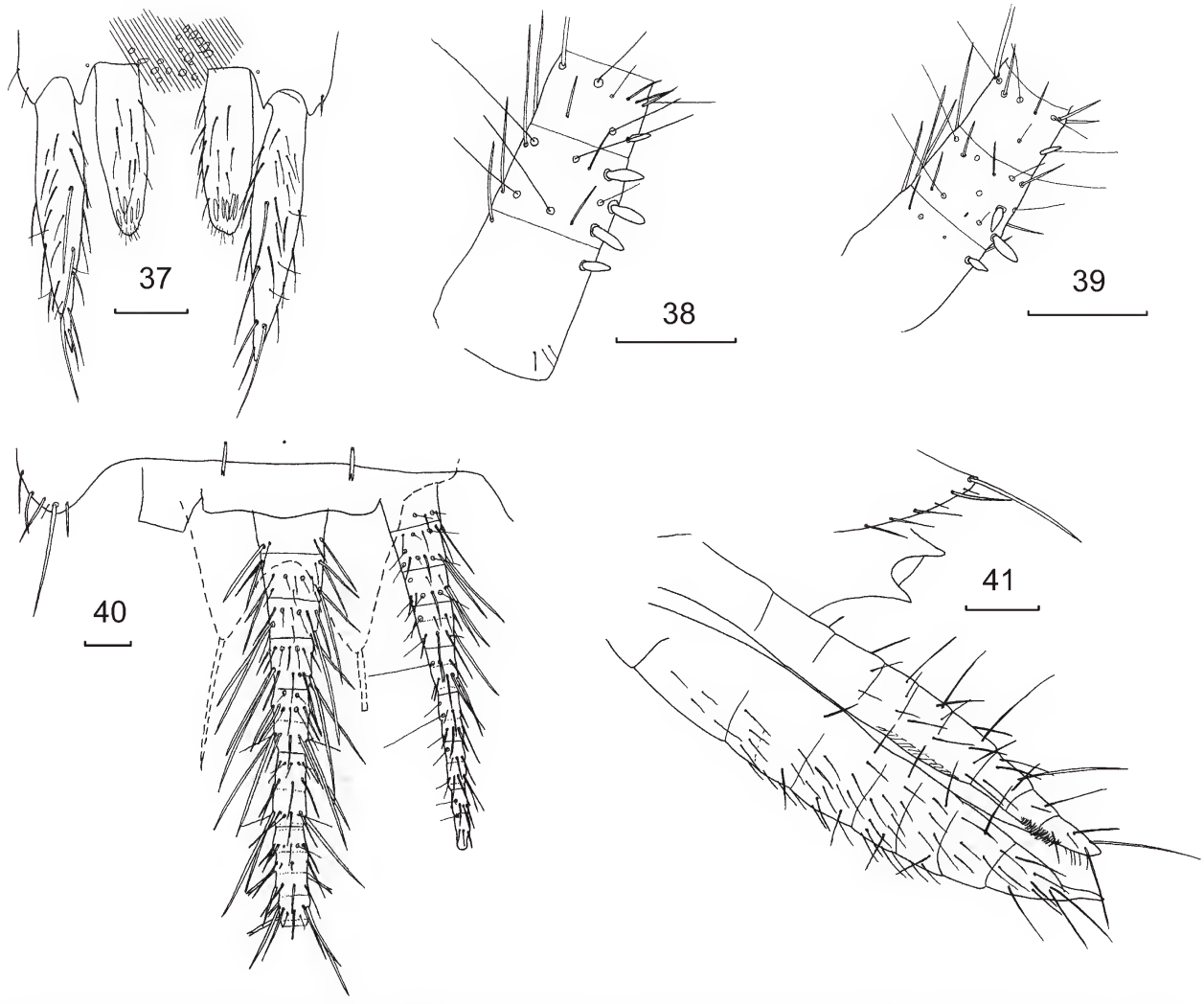
Legs typical for tribe (Fig. 21), tibia L/W ratio of legs PI 3.7 (range 2.9–4.6), PII 3.5 (3.2–3.7), PIII 3.7 (2.9–4.2); tarsi L/W ratio PI 6.4 (4.8–7.6), PII 7.1 (5.6–8.2), PIII 8.8 (7.5–10.8). Legs becoming progressively longer posteriorly with the tarsus increasing in length more than tibia. Presternum of prothorax with several setae, sternum between coxae with 2+2 long setae; sterna of meso- and metathoracic segments between the coxa with just 1+1 medial setae. Coxa large and flat with some scales; femur with one strong, narrow deeply bifurcated sub-lyriform macrochaeta sub-distally on anterior edge and two thicker longer macrochaetae on angle of ventral/posterior margin as well as many setae over the posterior half of the ventral surface; tibia covered with numerous setae, three distal lyriform macrochaetae (Fig. 22), two stronger spines near ventral apex and some stronger spines distally as well as two strong spines about one third the distance along the tibia, one almost on the posterior/ventral margin, the other more anteriorly on the face of the tibia; tarsus of four articles; pretarsus with two simple, curved, smooth lateral claws and a sharp erect medial empodial claw, pulvillae indistinct, possibly present as small fold externally at the base of the lateral claws (Fig. 21).

Abdomen. Tergites (Figs 23, 24) with submarginal abiesiform macrochaetae similar to thorax, diminishing in number as the segments become narrower, long marginal macrochaetae in each posterolateral corner and four or five setae along the paratergites which fold under the sides of the abdomen (Figs 23, 25, 26); posterolateral corners of urotergite IX produced into subtriangular posterolateral lobes (Fig. 27) with a long macrochaeta in each posterior corner (Fig. 28). Urotergite X with strong 1+1 macrochaetae on the acute apices separated by deep incision, which in both sexes, generally has a distinctly curved medial "corner", and one or two smaller apically bifurcated setae along inner and a few setae along the outer margins (Fig. 29), underside of urotergite X of males with 1+1 elongated fields of about 20 (range 14–24) modified sclerotised setae (sensory pegs) (Figs 30–32). Urosternites (Fig. 33) I glabrous, II with two very small setae medially on slightly produced margin as well as 2–3 setae on posterolateral margins, III with small medial styli, IV and V with small lateral styli and 1+1 submedial erect macrochaetae plus a few smaller setae as well as four or five setae on posterolateral corners; VI with 1+1 erect

Figures 2–18 [see facing page, p. 48]. *Australiatelura tasmanica* (Silvestri) *(2)* habitus ♀, dorsal aspect (K260974 K260975); *(3)* habitus ♀, lateral view (K377702); *(4)* dorsal scale (gbs001869); *(5)* ventral scale (K260975); *(6)* abiesiform seta of metathorax (gbs001869); *(7)* head (K377702); *(8)* antenna ♂ (gbs001868); *(9)* antenna ♂ (K260976); *(10)* idem, pedicel and basal three intervals of flagellum; *(11)* apex of antennae, showing terminal papilla *(tp)* and trichobothrium *(tr)* (gbs001868); *(12)* mandible (gbs001868); *(13)* maxilla (K260974); *(14)* idem, apices of lacinia and galea; *(15)* idem, apex of palp showing sensory papillae; *(16)* labium (gbs001876); *(17)* idem, apex of palp; *(18)* thoracic nota (gbs001869). Scale bars = 0.1 mm unless otherwise indicated.



Figures 21–36. *Australiatelura tasmanica* (Silvestri) *(21)* PIII (gbs001876); *(22)* apex of tibia with lyriform macrochaetae and tarsus (gbs001868); *(23)* anterior urotergite with paratergite folded outwards (K260977); *(24)* anterior urotergite (K260975); *(25)* idem, left posterolateral chaetotaxy; *(26)* idem (K260977), as well as one abiesiform macrochaeta; *(27)* urotergite IX (K260977); *(28)* idem, right posterolateral chaetotaxy (K260977); *(29)* urotergite X (K260975); *(30)* ventral view of urotergite X and cerci of ♂ with sensory pegs (gbs001868); *(31)* idem, (gbs001869); *(32)* sensory pegs on ♂ urotergite X (K260977); *(33)* urosternites II–IX (K260975); *(34)* posterior margin of urosternite VI (gbs001869); *(35)* vesicle of urosternite VI (K260975); *(36)* posterior margin of ♂ urosternite VIII (gbs001869). Scale bars = 0.1 mm unless otherwise indicated.



Figures 37–41. *Australiatelura tasmanica* (Silvestri) *(37)* parameres and styli IX of ♂ (gbs001869); *(38)* basal articles of ♂ cercus (K260977); *(39)* idem, (K260979), Friendly Beaches; *(40)* posterior margin of urotergite IX, right cercus and proximal section of median dorsal appendage of ♀ (K260975); *(41)* ovipositor (gbs001876). Cross-hatched areas obscured by dirt. Scale bars = 0.1 mm.

submedial macrochaetae and smaller setae, large eversible vesicles with about nine setae on vesicle (Figs 34, 35), lateral styli and lateral macrochaetae; VII similar except the vesicles are pseudovesicles, VIII in male narrower with more protruding posterior margin armed with eight or nine setae between the styli, also with two or three lateral setae (Fig. 36); IX divided into separate coxites (Fig. 37), larger styli (almost twice as long as those on other segments) and long subcylindrical parameres (about 2.6–3.5 times longer than wide) reaching to about half way along the styli; 1+1 setae laterad to the base of each paramere (near base of paramere between paramere and the stylus insertion). Penis with wide longitudinal opening surrounded by small setae and what appears to be large glands.

Cerci (Fig. 30) with eight or nine divisions all longer than wide, basal division not significantly longer than rest, proximal divisions in mature males, medially with stout, pigmented, apically rounded, modified spines (sensory pegs) similar to and in close proximity to those on underside of urotergite X (Figs 30, 31, 38. 39), the first division with one medium sized peg subapically and rarely an additional smaller peg, second division usually with two larger pegs, but occasionally with an additional smaller peg or in one case a third large peg and the third division with no or just one smaller peg in the proximal third, often only on one cercus and not the other; divisions from fourth divided into two annuli; all divisions with macrochaetae larger and more numerous on laterad surface, trichobothria as shown in Figs 30, 31, 38 and 39. —Median dorsal appendage also slender, about twice length of cerci with nine divisions, divided into annuli from the fourth or fifth division (Fig. 40), without pegs.

Female. Same as male except—pedicel lacking fovea, urosternite VIII divided into separate coxites and subtriangular subgenital plate (Fig. 33); ovipositor (Figs 33, 41) moderately bulbous with about eight to ten indistinct divisions, extending just beyond the end of stylus IX, ultimate division of anterior gonapophyses with two long setae, penultimate division with field of small hooked setae, ultimate division of posterior gonapophyses with distinct subtriangular pointed process.

Juvenile stages. One ♂ (HW 0.56) (K377691) had two very weak pegs developing on the cerci and three pegs beneath

urotergite X, while another ♂ (HW 0.55) (K377692) only had one peg on the underside of urotergite X. A juvenile male (HW 0.54) (K377683) had one thickened spine on a cercus but lacked any sensory pegs on the underside of urotergite X while three even smaller males (HW 0.50) (K377684, K377685 and K377690) had no obvious secondary sexual characters.

The valves of the ovipositor were just beginning to develop in one juvenile ♀ (HW 0.53) (K377703) and another (HW 0.58) (K377706), while another juvenile ♀ (HW 0.50) (K377686) showed no development of the ovipositor.

Biology. Panmyrmecophile, collected under stones usually with ants. They are often found walking upside down on the underside of the stone. Ant species include *Amblyopone australis* Erichson, *Camponotus consobrinus* (Erichson, 1842), *Camponotus nigriceps* Smith, 1842, *Colobopsis gasseri* F., *Iridomyrmex* sp., *Myrmecia esuriens* F. Smith, 1858, *Myrmecia fulviculis* Forel, 1913, *Rhytidoponera tasmaniensis* Emery, 1911, *Rhytidoponera victoriae* André, 1896 and *Pheidole* sp.

Remarks. Silvestri (1908a) erected the genus *Atopatelura* for the species *furcifera* collected in the nest of the ant *Myrmicaria natalensis eumenoides* (Gerstäcker, 1858) in the Democratic Republic of the Congo. It was distinguished from other genera by the presence of medial styli on urosternite III and by the armature (lyriform spines) on the tibia. In the same year, Silvestri (1908b) described *Atopatelura hartmeyeri*, *At. michaelseni* and *At. kraepelini* from south-west Western Australia. Stach (1935) described *At. spinifera* from Egypt. In 1949, shortly before his death, Silvestri described *At. tasmanica* from Hobart, Tasmania and *At. perarmata* from Eritrea. Paclt (1963) suggested that *At. tasmanica* may be a subspecies of *At. kraepelini*. Mendes (1995), in his review of the Israeli fauna, redefined the genus, splitting it into three genera, *Atopatelura sensu stricto* for *At. furcifera*, *Arabiatelura* for *spinifera*, *perarmata* and *Ar. palaestinensis* Mendes, 1995 from Israel and without having the opportunity to examine specimens, erected *Australiatelura* for the four Australian species based on Silvestri's descriptions. He distinguished *Australiatelura,* at least partly, on the apparent absence of modified setae or pegs on the cerci and underside of urotergite X.

Silvestri made no reference to modified setae or sensory pegs on any of the Atelurinae he described from Australia, however male specimens collected by the author from eastern New South Wales and Tasmania all showed these pegs. The type specimens of *Atopatelura tasmanica* were kindly loaned by MUSA allowing confirmation that pegs are indeed present at the base of the cerci as well as beneath urotergite X of all mature males. A redefinition of *Australiatelura* Mendes would be in order however this should be made with reference to material of the type species of the genus, *Atopatelura kraepelini*. Apart from the modified spines on the cerci and urotergite X, the species of this genus differ from both *Atopatelura* and *Arabiatelura* by the lack of abundant lyriform spines on the legs. While lyriform spines are found on the femur and tibia of the Australian species, these are restricted to just one and three at the dorsal apices of the respective leg segments.

The type material of *Atopatelura tasmanica*, while mostly in fair condition, has shown some deterioration over the years. The resin used for the slide material has dried out and cracked on several slides allowing air under the coverslip and causing distortion to some parts and there is some level of fungal growth. The material in alcohol is variable. Two specimens are completely shrivelled and unusable, the remainder are intact but the surface of the insects has taken on a granular powdery appearance making it difficult to observe clearly.

Details of the antennae were often used by Silvestri and others when describing species of the subfamily Atelurinae. This is the only subfamily in the Zygentoma where the antennae are relatively short, where distinct intervals and annuli can be counted and the completeness of the antenna confirmed by the presence of a unique terminal trifurcate papilla. Various authors use the chaetotaxy of the scape and pedicel, the presence of secondary sexual modifications on the pedicel in the male (e.g., fovea or apophyses), the number of antennal intervals, as well as the number and arrangement of trichobothria on all annuli, especially the first annulus of the flagellum, and the subdivision of more distal intervals. There are however limitations to the interpretation of these characters as follows:

Trichobothria on first annulus of flagellum. Counting the number of trichobothria on the first annulus can be complicated by the orientation of the antenna on the slide because trichobothria on the lateral margins can be difficult to distinguish especially if the long hair has been lost. More importantly, the delineation between the first and second annuli is often very difficult to discern and in the majority of cases no suture was obvious between the presumed annuli giving the impression that there are ten trichobothria on the annulus. The two most apical trichobothria do however spirally align with the pattern of trichobothria on the following annuli and their alignment with a second partial rosette of setae on the face away from the trichobothria suggests that the most distal trichobothria, when more than eight are counted, belong in fact to the second annulus of the flagellum. Otherwise the arrangement of the trichobothria seems to be consistent.

Number of antennal intervals. There was quite some variation in the number of intervals in "complete" flagellum with as few as 12.5 and up to 17 intervals counted. The apical annulus with its distinct sensilla was counted as a half interval if there was a trichobothrium at the apex of the adjacent annulus or partially divided annulus. There was also a difference between the left and right flagella of some specimens (for example, 16 vs 17). It is possible that such anomalies are the result of damage during previous instars, but does make it difficult to use the number of flagella intervals as a taxonomic character.

Subdivision of intervals and number of trichobothria. While there was an overall pattern there were some differences in the detail. A division into two annuli was generally visible by the sixth to the ninth interval of the flagellum; but there is a degree of subjectivity based on the interpretation of the limits of the first and second annuli and the criteria used for deciding when a subdivision was obvious. A further subdivision of the now distinct intervals into partially divided annuli was visible by the 10th to 13th interval, but the secondary subdivisions remained less distinct than the primary subdivsions. Differences were also noted between the left and right flagella on some individuals.

Secondary sexual characters of the male. There are 1+1 fields of sensory pegs on the underside of urotergite X in mature males. The number can vary between left and right sides of an individual and between individuals but had a roughly similar pattern. Numbers of pegs varied between about 14 and 27 and there was no reliable correlation between specimen size and the number of pegs. There are also pegs on the inner ventral aspect of basal divisions of the cerci. In nearly all cases there was just a large single peg on the first division but in one case there was a much smaller ancillary peg at the same level more dorsally, but only on one cercus. On the second division there were generally two large pegs and often one or two smaller ancillary pegs; in one case there were three large pegs and no ancillary pegs on one of the cerci. On about half the specimens examined, the third division had a small peg on just one cercus. While there seems to be real differences between the species, the variation within a species needs to be taken into account.

Australiatelura tasmanica seems to be most closely related to *Australiatelura hartmeyeri* (Silvestri) from WA. It is the only other described species with fairly narrow subcylindrical paramera in the male but it has quite long abiesiform macrochaetae on the thoracic and abdominal terga. There is also another "species" commonly found under stones or in soil with ants around Sydney, NSW which also has narrow subcylindrical paramera. While it was initially thought these were the same species, more detailed measurement data suggest the Sydney "species" is generally larger with shorter abiesiform macrochaetae, with some small differences in the arrangement of the secondary sexual characters on the cerci and possibly more trichobothria on the first annulus of the antennae. These differences need to be investigated in more detail.

Australiatelura eugenanae n.sp.

Figs 42–78

Type material. Holotype: ♂ (HW 0.93) (ANIC 5-000047 on two slides) TAS: Eugenana Arboretum, 41.23°S 146.30°E, 29.iv.1987, L. Hill, under several stones, pasture edge by Eucalypt forest with *Amblyopone australis* Erichson, 1842 and *Pheidole* sp. [FORMICIDAE]. Paratypes (3♂♂, 2♀♀): ♂ (HW 0.78) (ANIC 5-000048 in alcohol) same data as holotype; ♀ (HW 0.83) (ANIC 5-000049 on two slides) same data as holotype; ♂ (HW 0.83) (ANIC 5-000050 on two slides) same data as holotype; ♀ (HW 0.78) (TMAG F14808 in alcohol) Eugenana Arboretum, 41.22556°S 146.30208°E, 17.xii.2012, S. Bunton, beside "White Gum Grove", under stones; ♂ (HW 0.63) (TMAG F14809 in alcohol), same data as previous.

Other Tasmanian material examined (2♂♂, 5♀♀): ♀ (HW 0.90) (K377679 in alcohol) TAS: Friendly Beaches, 24.i.1987, G. Smith and L. Wheeler, edge of beach with *Rhytidoponera tasmaniensis* Emery, 1911 and *Pheidole* sp.; ♀ (HW 0.70) (AMS K377704 in alcohol) same data as previous; ♀ (HW 0.83) (K377688 in alcohol) TAS: Friendly Beaches, 41°59'20.8"S 148°17'14.8"E, 31.v.2011, S. Bunton; ♂ (HW 0.73) (K260972 K260973 on two slides) TAS: Bicheno lookout, 41.87757°S 148.30612°E, 64 m asl, 19.xii.2011, G. Smith and S. Bunton, under granite stones with ants; ♀ (HW 0.73) (K377693 in alcohol) same data as previous; ♀ (HW 0.68) (K377695 in alcohol) same data as previous; ♂ (HW 0.55) (K377698 in alcohol) same data as previous.

Non-Tasmanian material examined (1♂, 2♀♀): ♀ (HW 0.90) (K377677 in alcohol) VIC: Wilson's Promontory, Telegraph Saddle, 23–24. iv.2013, G. Smith, under stones with ants in dense scrub; ♂ (HW 0.75) (K261118 K261119 on two slides) same data as previous; ♀ (HW 0.80) (K261120 K261121 on two slides) same data as previous.

Diagnosis. This species is distinguished from other species in the genus by a combination of characters including its short terminal filaments, the length and number of abiesiform notal macrochaetae, the shape and chaetotaxy of the notch of urotergite X and the absence of obvious laminar pulvillae on the pretarsus. In the male it is further distinguished by its wide parameres and more numerous modified pegs at the base of the cerci.

Description. *Appearance*. In life uniform golden colour (Fig. 42), alcohol preserved specimens off-white. Small to medium size, typical ateluriform shape (tear-drop shape tapering strongly posteriorly) (Fig. 43).

Body length. About 2.8 times longer than wide (range 2.4–3.2); small to medium size, H+B 4.85 mm in largest specimen examined), range of HW 0.63–0.93 mm; head hypognathous (Fig. 44), antennae incomplete in most specimens, but when complete about 0.32–0.38 H+B; cerci mostly incomplete but quite short although possibly relatively longer on smaller specimens, longest measured cercus 0.15 H+B, surpassing apex of urotergite X by less than the length of the tergite; median dorsal appendage damaged in all specimens, longest surviving section 0.21 H+B.

Scales. Of variable shape but mostly rounded or pointed apically, multi-radiate with about 12–22 rays, the rays of the dorsal scales (Figs 45, 46) not or only slightly extending beyond the margins but rays on the ventral scales distally free for about one tenth their length (Fig. 47); scales lacking from head and its appendages, from the legs (although present on coxae), paramera, cerci and median dorsal appendage and ovipositor (present on subgenital plate).

Macrochaetae. Simple or apically bifurcated, some on median dorsal appendage with very strong apical bifurcations, those on posterior margin of tergites abiesiform about 90–120μ in length in larger specimens (Fig. 48) or on average 1.37 times the length of adjacent scales (range 1.00–1.65).

Head. More or less free, only just covered by prothorax at hind margin (possible preservation effect), vertex with scattered small, fine setae as well as distinctly stronger macrochaetae in about four transverse rows, the rows becoming less distinct anteriorly where the setae become smaller and more numerous (Fig. 49). —Labrum with a few fine setae. —Antennae incomplete in all type specimens, longest surviving paratype with antenna 0.22 times H+B (ANIC 5-000049 ♀) (Fig. 50) with at least 11 flagellar intervals. Antennae of specimens from Wilsons Promontory with 12 or more flagellar intervals and up to 0.38 H+B. Pedicel of adult male (Fig. 51), with a shallow fovea in the proximal half on ventral face with several short setae within or on the margins of the depression. Intervals beyond 6th to 7th divided into two annuli, with further subdivisions becoming apparent beyond the 9th to 11th intervals; scape with rosette of macrochaetae apically and several along ventral face, pedicel with a delicately bifurcate macrochaeta longer and stronger than others in the subapical rosette and several shorter setae along ventral face, first annulus of flagellum with eight trichobothria, subsequent annuli/intervals up to 9th to 11th with two trichobothria located on the most distal annulus of each interval, more distal intervals with just one trichobothrium; last interval lost in all type material but specimen from Wilsons Promontory has the typical apical papilla. —Mandibles (Figs 52, 53) with well-

Figure 42. *Australiatelura eugenanae* n.sp. Wilsons Promontory.

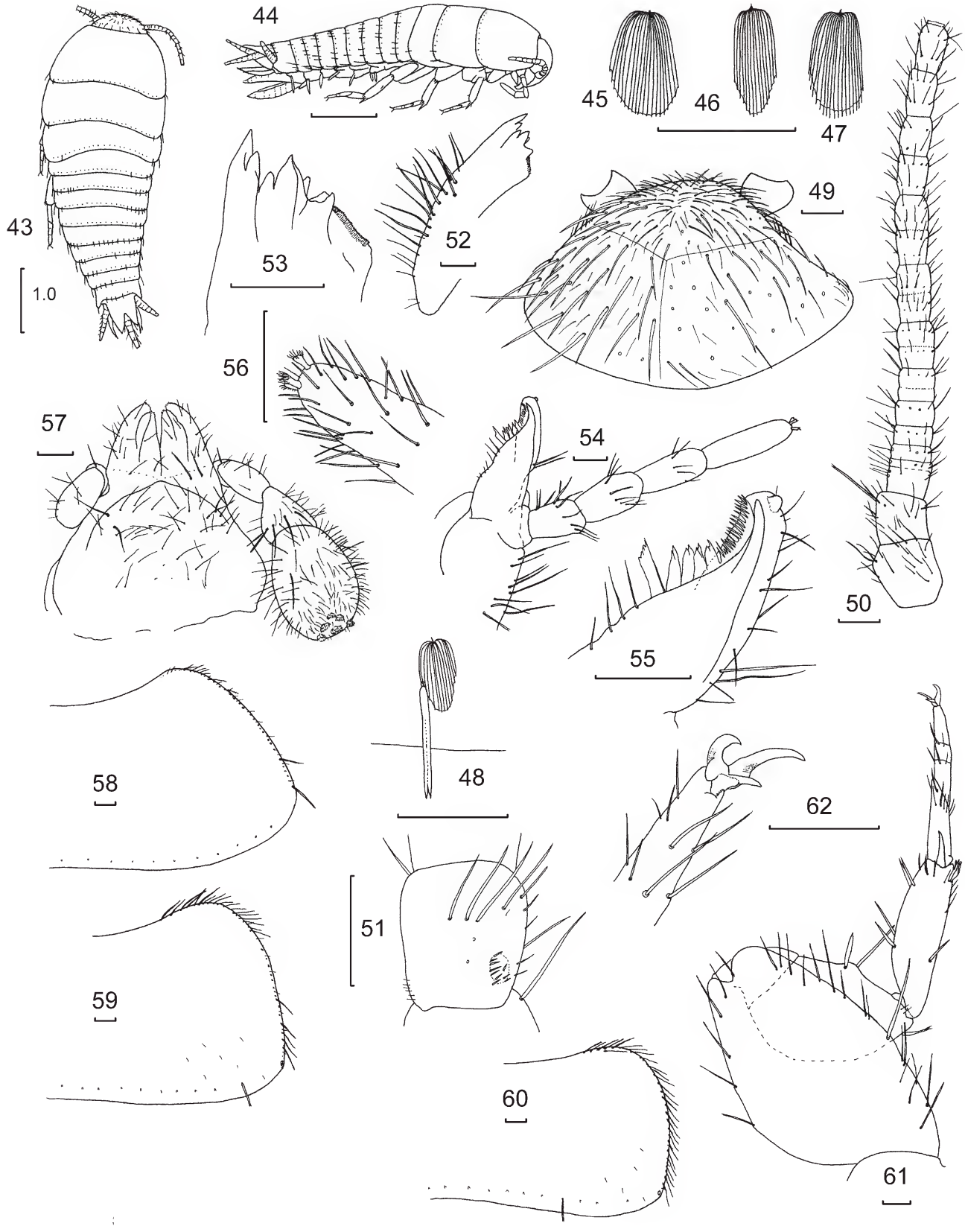
developed incisor and molar regions. —Maxilla (Fig. 54) with lacinia just slightly shorter than the galea; lacinia with simple pointed apex, pectinate prostheca just extending beyond tip of lacinia; galea single low broad apical conule (Fig. 55). Maxillary palp stout, with three feathered papilla distally (Fig. 56); apical article of palp 3.6–3.7 times longer than wide with sub-parallel sides, almost 1.5–1.7 times longer than penultimate article and slightly thinner. —Labium with widely rounded posterolateral margins (Fig. 57); ultimate article of palp truncated ovate about 1.11–1.33 times as long as wide with usual six sensory papillae distally; all articles including base with many smaller and a few somewhat stronger setae.

Thorax. Large, about 0.36–0.42 H+B, nota strongly arched forming cavity within which the legs may be held; all nota (Figs 58–60) with submarginal posterior row of 21–28 subequally spaced abiesiform setae with somewhat acute apices (Fig. 48) with about ⅓–½ their length surpassing the posterior margin of the nota; lateral margins of nota with curved setae (about 1¼–1½ times the length of the abiesiform setae) as well as smaller straight setae, the most posterior seta on each side much larger than others being about twice the length of the abiesiform setae; disc of nota with scattered short, delicate setulae among the scales. Prothoracic nota longer than each of meso- and metanota but not as long as both together.

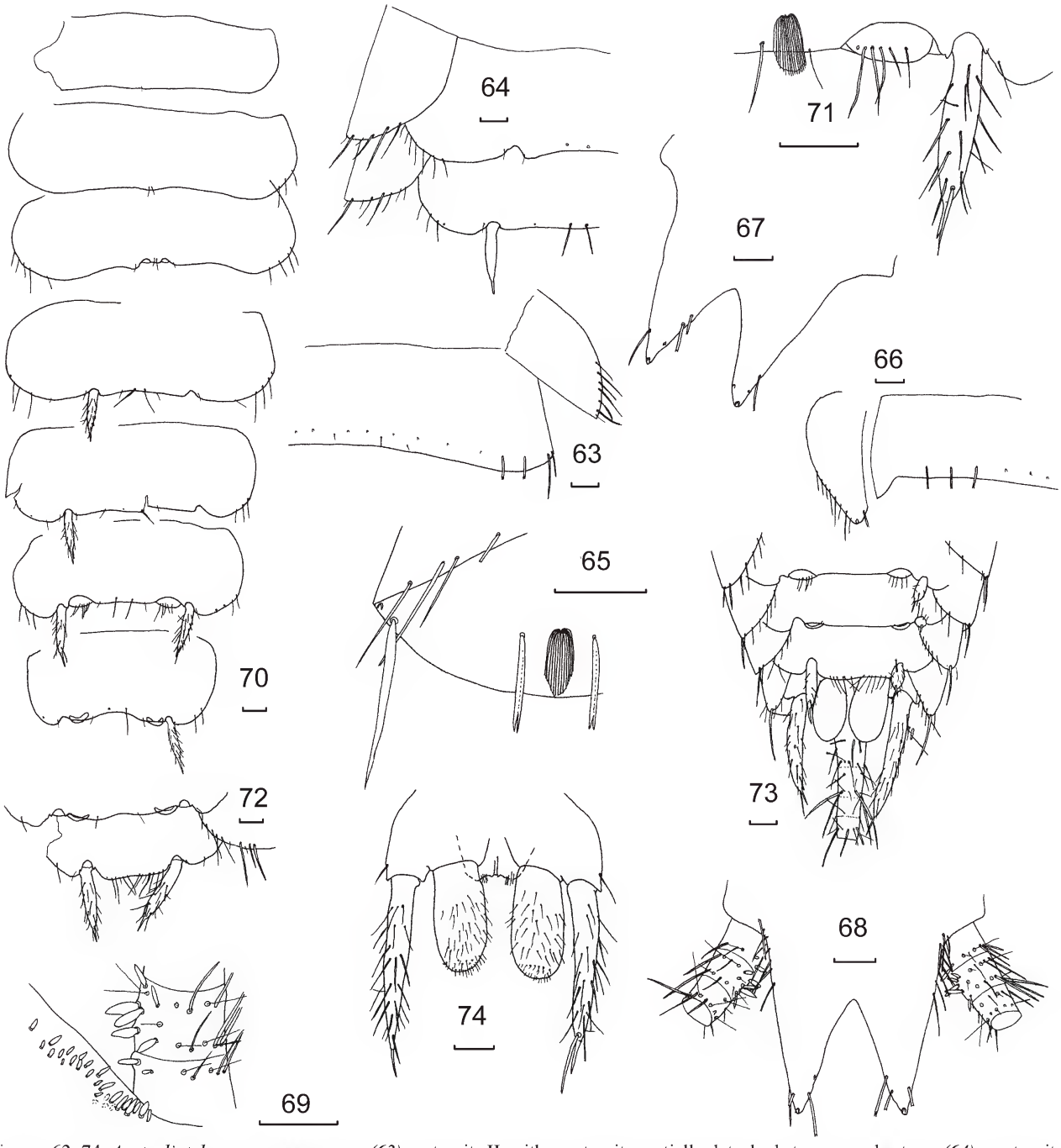
Legs typical (Fig. 61) for genus, tibia L/W ratio of legs PI 3.3 (range 2.9–4.0), PII 3.2 (2.8–3.6), PIII 3.1 (2.5–3.5); tarsi L/W ratio PI 6.4 (5.1–7.3), PII 6.4 (5.6–7.1), PIII 7.9 (7.0–9.5). coxa large and flat with some scales and long setae along the lateral margins; femur with one strong, fairly robust deeply bifurcated sub-lyriform macrochaeta sub-distally on anterior edge and two (or three) longer macrochaetae (the more proximad one thicker and slightly spindle-shaped, the other (two) almost twice as long and tapering) on raised angle of ventral posterior margin; tibia with three robust subdistal lyriform macrochaetae, ventral posterior margin with two stronger stout macrochaetae about ¼ the distance back along the tibia from the distal end and some smaller but still robust setae more distally as well as two strong macrochaetae a bit more than ⅓ the length of the tibia from its proximal end, one almost on the posterior/ventral margin, the other submarginally above, and at the same level, one stout macrochaeta on the ventral face near the anterior-dorsal margin plus the usual apical spine; tarsi of four distinct articles; pretarsus with two quite long and slender, simple, curved, smooth lateral claws and a shorter, sharp erect medial empodial claw, apparently lacking pulvillae (Fig. 62).

Abdomen. All urotergites wrap around the sides of the body with a distinct fold or carina at the most lateral part, making specimens difficult to dissect without tearing the paratergites at this fold and even more difficult to lay out flat (Fig. 63). The consistency of tearing suggests that there is a suture at this point however it is not visible through the scales, the fold is quite severe on all anterior segments forming longitudinal hollows on the anterior segments below each side of the abdomen where they overlap the urosternites; these hollows presumably offer some protection to the legs when required; the margin of each paratergite with several setae between the outer-most macrochaeta and the edge of the urotergite (Fig. 64), however because of the fold these setae are actually located medial and ventral to the largest lateral macrochaeta of each segment (Fig. 65); urotergites I–IX with submarginal rows of 5–25 abiesiform setae similar to the thorax, progressively decreasing in number posteriorly, posterolateral corners of urotergite IX produced into subtriangular posterolateral lobes that also wrap around tightly and are prone to tearing at a predetermined line, but in contrast to the more anterior urotergites this line is mediad to the largest lateral seta (Fig. 66), five to six submarginal abiesiform setae along the medial posterior margin as well as one abiesiform seta mediad but adjacent to the large posterolateral macrochaeta. Urotergite X (Figs 67, 68) with 1+1 strong macrochaetae on the acute posterior corners with a deep V-shaped insertion between the apical macrochaetae which generally, in older specimens of both sexes, does not have a very rounded medial "corner; the notch is less noticeably deep and acute in younger specimens and not very different to that of *Au. tasmanica*; the inner margin of the notch has one to three short apically cleft setae and the outer margins have one to three setae near the apex. Underside of urotergite X in mature males with 1+1 elongated fields of about 20–30 modified sclerotised setae or pegs (Fig. 69).

Urosternites (Fig. 70) much less wide than urotergites; urosternite I glabrous or with a single very small medial seta; II with two very small submarginal setae medially on a slightly convex margin as well as 2–4 setae on the posterolateral margins; III with small medial styli and small 1+1 submarginal setae between the stylus and small sensory setae adjacent to the base of the styli, 4–6 setae on each posterolateral corner; IV–VII with small lateral styli and 1+1 submedial erect macrochaetae and 1+1 smaller setae lateral to these as well as three to seven setae on posterolateral corners; VI also with large eversible vesicles with five or six simple setae on face of vesicle (Fig. 71), VII with pseudovesicles, urosternite VIII in male entire (Figs 72, 73) with posterior margin between the styli protruding slightly and about ten setae along its posterior margin; urosternite IX in male divided into separate coxites with broad apically rounded parameres reaching to about half the length of the styli, 1.72–2.15 times longer than wide (Figs 73, 74). Penis small, largely hidden by parameres, with



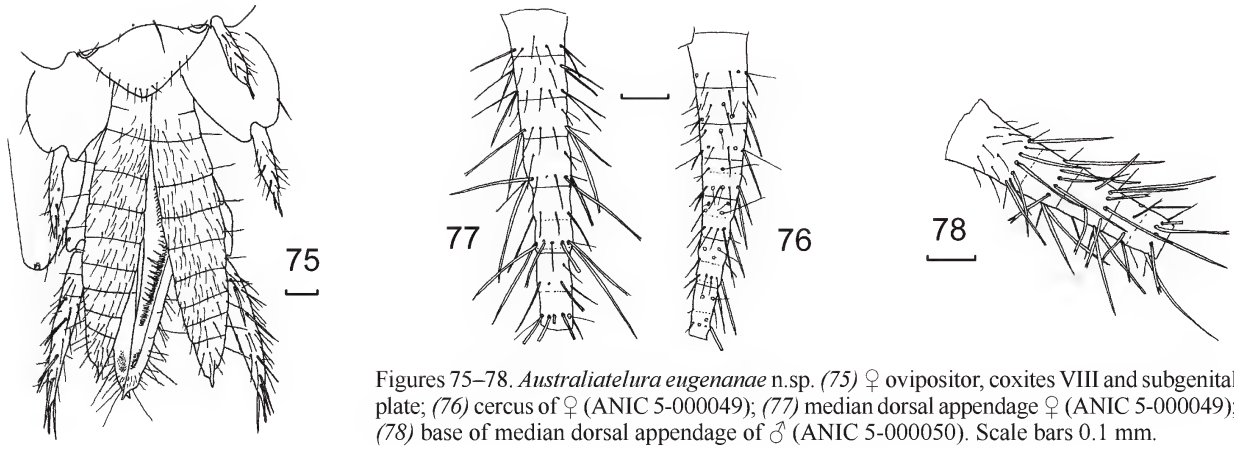
Figures 43–62. *Australiatelura eugenanae* n.sp. *(43)* habitus, dorsal; *(44)* habitus ♀, lateral; *(45)* dorsal scale; *(46)* dorsal scale; *(47)* ventral scale; *(48)* scale and abiesiform macrochaeta of metanotum; *(49)* head; *(50)* left antenna; *(51)* idem, ♂ pedicel; *(52)* mandible, *(53)* idem, molar and incisor regions; *(54)* maxilla (larger setae only); *(55)* idem, lacinia and galea; *(56)* idem, apex of maxillary palp; *(57)* labium; *(58)* pronotum; *(59)* mesonotum; *(60)* metanotum; *(61)* PIII (larger setae only); *(62)* idem, pretarsus. Scale bars = 0.1 mm.



Figures 63–74. *Australiatelura eugenanae* n.sp. *(63)* urotergite II, with paratergite partially detached at presumed suture; *(64)* urosternites IV and V, showing overlap of paratergites; *(65)* anterior urotergite, lateral chaetotaxy, smaller setae on paratergite lying below; *(66)* urotergite IX, with detached paratergite; *(67)* urotergite X of female; *(68)* urotergite X of male and base of cerci; *(69)* pegs on cerci and pegs beneath urotergite X (latter drawn through the tergite); *(70)* urosternites I–VII; *(71)* vesicles and stylus of urosternite VI; *(72)* posterior margin of urosternites VII and VIII of male; *(73)* urosternites VI–IX with parameres, styli and base of median dorsal appendage (drawn in alcohol before mounting); *(74)* coxites IX and parameres after slide mounting. Scale bars 0.1 mm.

narrow opening surrounded by small setae on tubercules (Fig. 74). Urosternites VIII in female divided into separate coxites with subtriangular subgenital plate also with styli and lateral macrochaetae (Fig. 75); urosternite IX in female also divided into separate coxites with larger styli (almost twice as long as those on other segments); ovipositor (Fig. 75) moderately bulbous with ten divsisions, apices of all gonapophyses produced into small triangular processes, ultimate divisions of posterior gonapophyses with two long setae, penultimate division with field of small hooked setae.

Cerci incomplete in most specimens but fairly short (extending beyond the apex of urotergite X, excluding the macrochaetae, by no more than the length of urotergite X), with eight or nine divisions, divisions from fourth divided into annuli, basal division longer than second division, setae and trichobothria as in Figs 68 and 76; cerci in mature males with sensory pegs on inner ventral surface (Figs 68, 69); one or two large and one small peg on the basal division, two to five large and zero to two smaller ancillary pegs on the second division, third division usually without pegs



Figures 75–78. *Australiatelura eugenanae* n.sp. *(75)* ♀ ovipositor, coxites VIII and subgenital plate; *(76)* cercus of ♀ (ANIC 5-000049); *(77)* median dorsal appendage ♀ (ANIC 5-000049); *(78)* base of median dorsal appendage of ♂ (ANIC 5-000050). Scale bars 0.1 mm.

although one specimen (K260973 from Bicheno) has a single large peg on division three on just one of its cerci; median filament incomplete in all type specimens (Figs 77, 78), specimens from Bicheno and Wilsons Promontory with eight or nine divisions, the basal three or four entire, and further pseudo-subdivided into annuli from the seventh or eighth division; similar in males and females, i.e. lacking modified spines.

Juvenile stages: one ♂ (HW 0.55) (K377698) already had pegs developed on its cerci.

Biology. Panmyrmecophilic, collected under stones with ants in forest or on the edge of pasture. Host ant species include *Amblyopone australis* Erichson, 1842, *Myrmecia esuriens* Fabricius, 1804, *Pheidole* sp. and *Rhytidoponera tasmaniensis* Emery, 1898. Not all host ants have yet been identified.

At several locations both *Au. eugenanae* and *Au. tasmanica* were collected in the same collection tube. Because specimens found under several stones within a few metres of each other were bulked into the same collection tube, it is not known whether these two species were in the same or separate ant nests.

Etymology. The species is named for the type locality of Eugenana.

Remarks. While determination of mature males is fairly straight forward due to the wide parameres, short cerci and the more complex arrangement of pegs on the cerci, determination of the juveniles and females is more uncertain. Both Tasmanian *Australiatelura* species have been found under the same or adjacent stones possibly within the same ant colony. Some doubt exists regarding the determination of female specimens in the material examined, especially when smaller and if they have not been mounted on slides. Females identified as *Au. eugenanae* were found together with males of *Au. eugenanae* and have a body size greater than the normal range of *Au. tasmanica* or were large, with distinctly shorter terminal filaments and/or with the medial angle of the notch fairly acute, not distinctly rounded. The allocation of the very small juvenile *Australiatelura* specimens to species is even more suspect.

Australiatelura eugenanae appears to be closer to *Au. michaelseni* (Silvestri, 1908) or *Au. kraepelini* (Silvestri, 1908), both of which were described from Western Australia. *Australiatelura michaelseni* is only known from female specimens which appear to have similarly short terminal filaments, long slender lateral claws of the pretarsus, a reasonably acute notch on urotergite X and quite long abiesiform macrochaetae but from Silvestri's illustrations it has a larger rounder subgenital plate, the valves of the ovipositor do not appear to have the pointed apices, there are strong setae along the whole length of the inner margin of the notch of urotergite X and the base of the lateral claws of the pretarsus is surrounded by a short obtuse laminar process. Silvestri's original description and illustrations are by no means adequate, especially due to the lack of a male specimen. Womersley (1939) illustrated the male genitalia of a specimen which has short terminal filaments and broad parameres similar to *Au. eugenanae*. This illustration is labelled "16. J. Male genitalia" without explicitly nominating the species but this is almost certainly a typographical error and the illustration refers to male specimens from Mallacoota in southern NSW which he believed represented *Au. michaelseni* illustrated in his Figs 16 G–I. Reference to Silvestri's type specimen of *Au. michaelseni* could give supporting evidence that the abiesiform macrochaetae are long but cannot answer the question regarding the shape of the parameres. New topotypical material from WA which included a male could be useful in resolving this question.

Australiatelura kraepelini was described using both male and female specimens. It appears to have quite long abiesiform macrochaetae, the paramera of the males are wider than those of *Au. tasmanica* but not quite as wide as those of *Au. eugenanae*. The subgenital plate is about the same size as that of *Au. eugenanae* but more rounded than sub triangular, however this can be an artefact of the way the specimen is observed. *Australiatelura kraepelini* differs from *Au. eugenanae* in that it, like *Au. michaelseni*, is reported to have laminar processes at the base of the lateral claws and a long series of strong setae on the inner margin of the notch of urotergite X. Silvestri made no mention of conical processes at the base of the cerci however he also overlooked these with *Au. tasmanica* so the types of *Au. kraepelini* should be checked. *Australiatelura kraepelini* also seems to have much longer antennae but as mentioned under the remarks for *Au. tasmanica*, antennal length can be quite variable.

The finding of *Au. eugenanae* on both the Australian mainland and in Tasmania is not unexpected as the two have been connected many times over the last 2 million years, most recently only 20, 000–10, 000 years ago.

Family Lepismatidae Latreille, 1802

Subfamily Heterolepismatinae Mendes, 1991

Heterolepisma Escherich, 1905

Heterolepisma Escherich, 1905: 63.
Isolepisma Escherich, 1905: 61.
Notolepisma Tillyard, 1924: 241.

Type species. *Lepisma pampeana* Silvestri, 1902 by subsequent designation of Paclt, 1967: 25.

Heterolepisma kraepelini Silvestri, 1908

Heterolepisma kraepelini Silvestri, 1908b: 50.

Remarks. Originally described from Yalgoo in Western Australia, Womersley (1939) reported the species as frequently found under the bark of Eucalypts in the foothills of the Mt Lofty Ranges near Adelaide, SA and at Trevallyn, TAS. Collecting by the current author has found the genus to be very diverse in Australia with numerous undescribed species most seeming to be moderately localised in their distribution. Furthermore, the systematics of the genus today includes many more characters than was the case in the time of Silvestri and Womersley (e.g., the chaetotaxy of urotergite I). The Trevallyn specimen has not been seen by the current author although it could be within the collection of the South Australian Museum. It is quite likely that it may not belong to *H. kraepelini* and the record of this species in Tasmania should be treated as uncertain. In many characters it resembles the following species although *H. kraepelini* is reported to have more pairs of styli and it is unlikely that this would have been mistaken by Womersley.

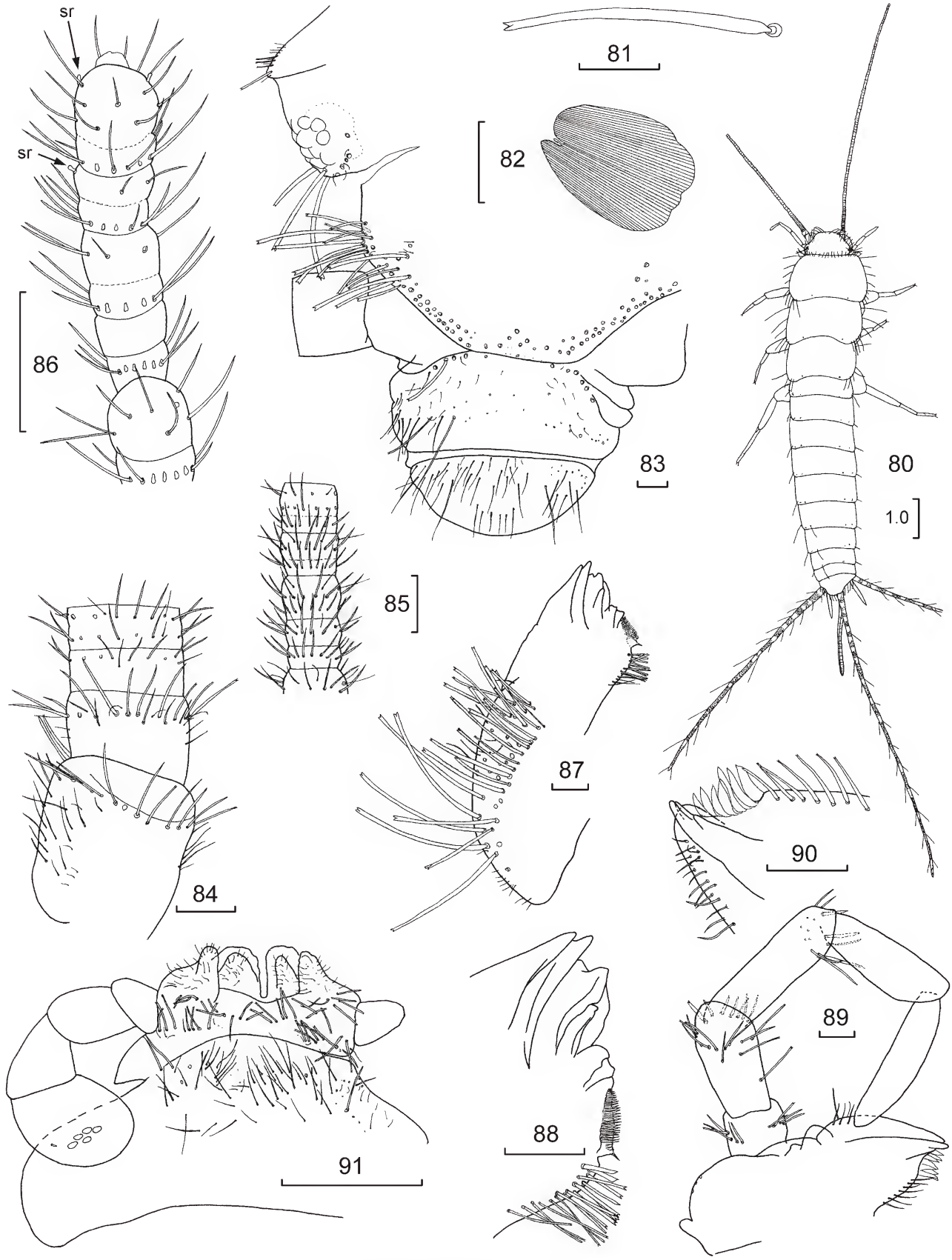
Heterolepisma buntonorum n.sp.

Figs 79–120

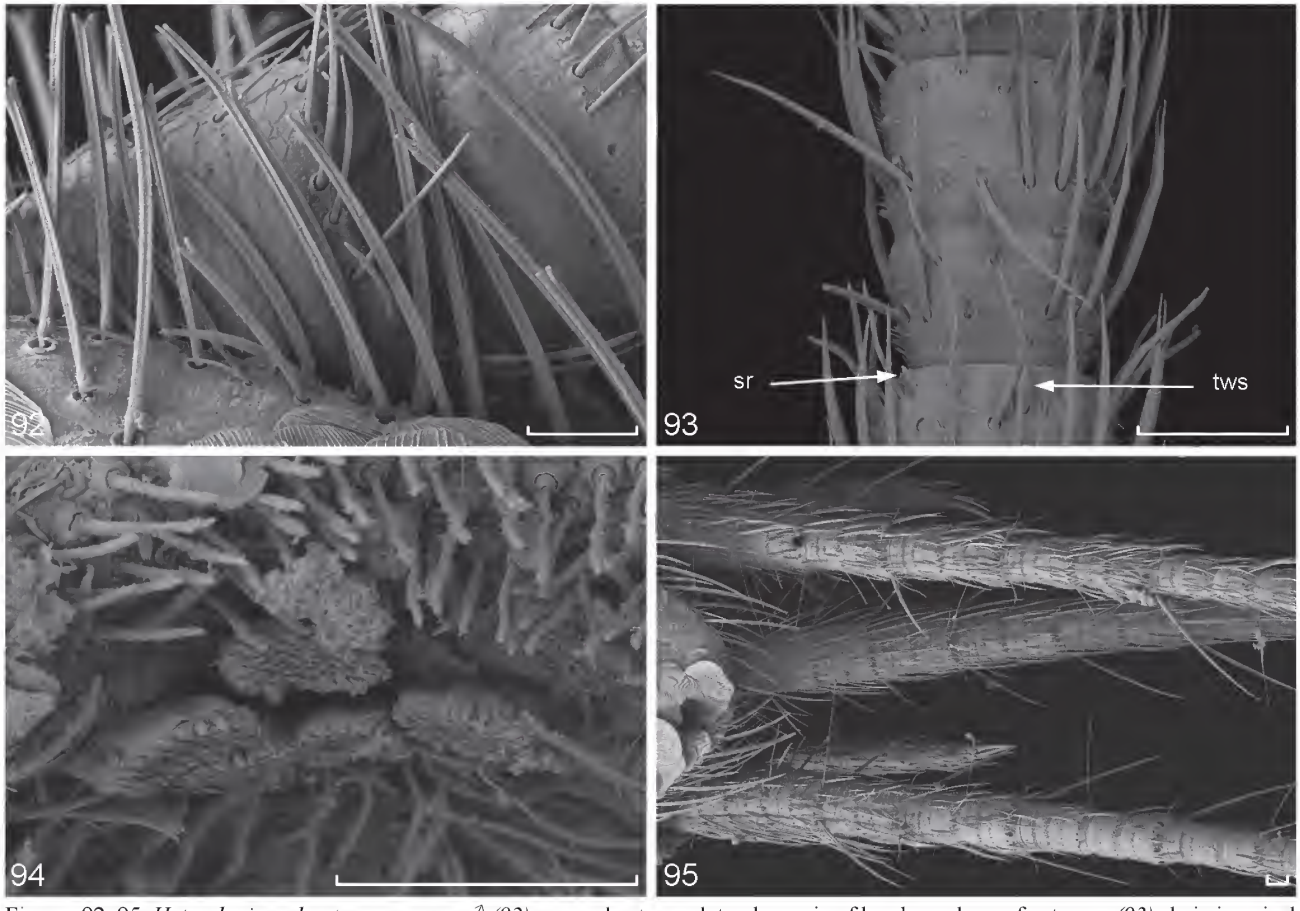
Type material. Holotype ♀ (HW 1.38) (K261010, K261011 on two slides) TAS: Bicheno lookout, 41.87731°S 148.30553°E, 30 m asl, 19.xii.2011, G. Smith and S. Bunton, under clean bark of live tree, three layers down. Paratypes (8♂♂, 4♀♀): ♀ (HW 1.26) (K377619 in alcohol) same data as holotype; ♀ (HW 1.18) (K377620 in alcohol) same data as holotype; ♂ (HW 1.25) (K261012 K261013 on two slides) TAS: Bicheno lookout, 41.87757°S 148.30612°E, 64 m asl, 19.xii.2011, G. Smith and S. Bunton, leaf litter under rock overhang; ♂ (HW 1.00) (K377621 in alcohol) same data as previous; ♀ (HW 1.20) (K377622 in alcohol) same data as previous; ?♂ (HW 1.10) (K377623 in alcohol, end of abdomen damaged) same data as previous; juvenile ♀ (HW 0.85) (K377624 in alcohol) same data as previous; juvenile ♂ (HW 0.79) (K377625 in alcohol) same data as previous; juvenile ♂ (HW 0.80) (K377626 in alcohol) same data as previous; ♂ (HW 1.15) (gbs001772) used for scanning electron microscopy, same data as previous; ♂ (HW 1.13) (K377627 in alcohol) TAS: Bicheno lookout, 41.87766°S 148.30613°E, 68 m asl, 19.xii.2011, G. Smith and S. Bunton, under bark of dead tree, possibly in abandoned termite workings; ♂ (HW 1.04) (K377628 in alcohol) same data as previous.

Other material examined (2♂♂ 52♀♀): ♂ (HW 1.05) (K261108 K261109 on two slides) TAS: Spring Beach, 42.58012°S 147.89847°E, 53 m asl, 19.xii.2011, G. Smith and S. Bunton, under bark of fallen Eucalypt in termite galleries; ♂ (HW 1.00) (K377629 in alcohol), same data as previous; juvenile ♀ (HW 0.93) (K377630 in alcohol) same data as previous; juvenile ♀ (HW 0.95) (K377631 in alcohol) same data as previous; ♀ (HW 1.48) (K261014, K261015 on two slides) TAS: Friendly Beaches, 41.99301°S 148.27914°E, 63 m asl, 20.xii.2011, G. Smith and S. Bunton, dry woodland, bark spray to trunk of live Eucalypt; ♀ (HW 1.28) (K261016, K261017 on two slides) same data as previous; ♀ (HW 1.13) (K377632 in alcohol) same data as previous; ♀ (HW 1.05) (K377633 in alcohol) same data as previous; ♀ (HW 1.43) (K377634 in alcohol) TAS: Friendly Beaches, 41.99296°S 148.27901°E, 63 m asl, 20.xii.2011, G. Smith and S. Bunton, dry woodland, pyrethrum spray into burned hollow in Eucalypt; ♀ (HW 1.05) (K377635 in alcohol) same data as previous; juvenile ♀ (HW 0.85) (K377636 in alcohol) same data as previous; juvenile ♀ (HW 0.58) (K377637 in alcohol) same data as previous; ♀ (HW 1.28) (TMAG F14810 in alcohol) same data as previous; ♀ (HW 1.30) (TMAG F14810 in alcohol) same data as previous; ♀ (HW 1.20) (K377638 in alcohol) TAS: Friendly Beaches, 41.99307°S 148.27903°E, 62 m asl, 20.xii.2011, G. Smith and S. Bunton, dry woodland, pyrethrum spray fallen *Eucalyptus*; ♀ (HW 1.00) (K377639 in alcohol) same data as previous; ♀ (HW 0.93) (K377640 in alcohol) same data as previous; juvenile ♀ (HW 0.83) (K377641 in alcohol) same data as previous; juvenile ♀ (HW 0.88) (K377642 in alcohol) same data as previous; juvenile ♀ (HW 0.78) (K377643 in alcohol) same data as previous; juvenile ♀ (HW 0.85) (K377644 in alcohol) same data as previous; juvenile ♀ (HW 0.85) (K377645 in alcohol) same data as previous; juvenile ♀ (HW 0.80) (K377646 in alcohol) same data as previous; juvenile ♀ (HW 0.78) (K377647 in alcohol) same data as previous; ♀ (HW 1.30) (K261112 K261113 on two slides) TAS: Douglass-Apsley NP, Apsley Gorge near car park, 41.86514°S 148.18968°S 102 m asl, 20.xii.2011, G. Smith and

Figure 79. *Heterolepisma buntonorum* n.sp. Bicheno Lookout, Tasmania.



Figures 80–91. *Heterolepisma buntonorum* n.sp. ♀ holotype unless otherwise indicated by specimen number *(80)* habitus; *(81)* macrochaeta from head above antenna; *(82)* scale from urotergite; *(83)* head; *(84)* antenna pedicel, scape and two intervals of flagellum; *(85)* idem, intervals from mid-section of flagellum; *(86)* idem, most distal remaining interval (near apex) showing basiconic sensory rods *(sr)* (K261116); *(87)* mandible; *(88)* idem, incisor and molar regions; *(89)* maxilla, minor setae omitted; *(90)* idem, lacinia; *(91)* labium, omitting setae from palp. Scale bars = 0.1 mm unless otherwise indicated.



Figures 92–95. *Heterolepisma buntonorum* n.sp. ♂ *(92)* macrochaetae on lateral margin of head near base of antenna; *(93)* chain in apical region of flagellum showing rod-like basiconic sensillae *(sr)* and thin-walled sensilla *(tws)*; *(94)* compact sensillae of labial palp; *(95)* base of terminal filaments and stylus. Scale bars = 0.05 mm.

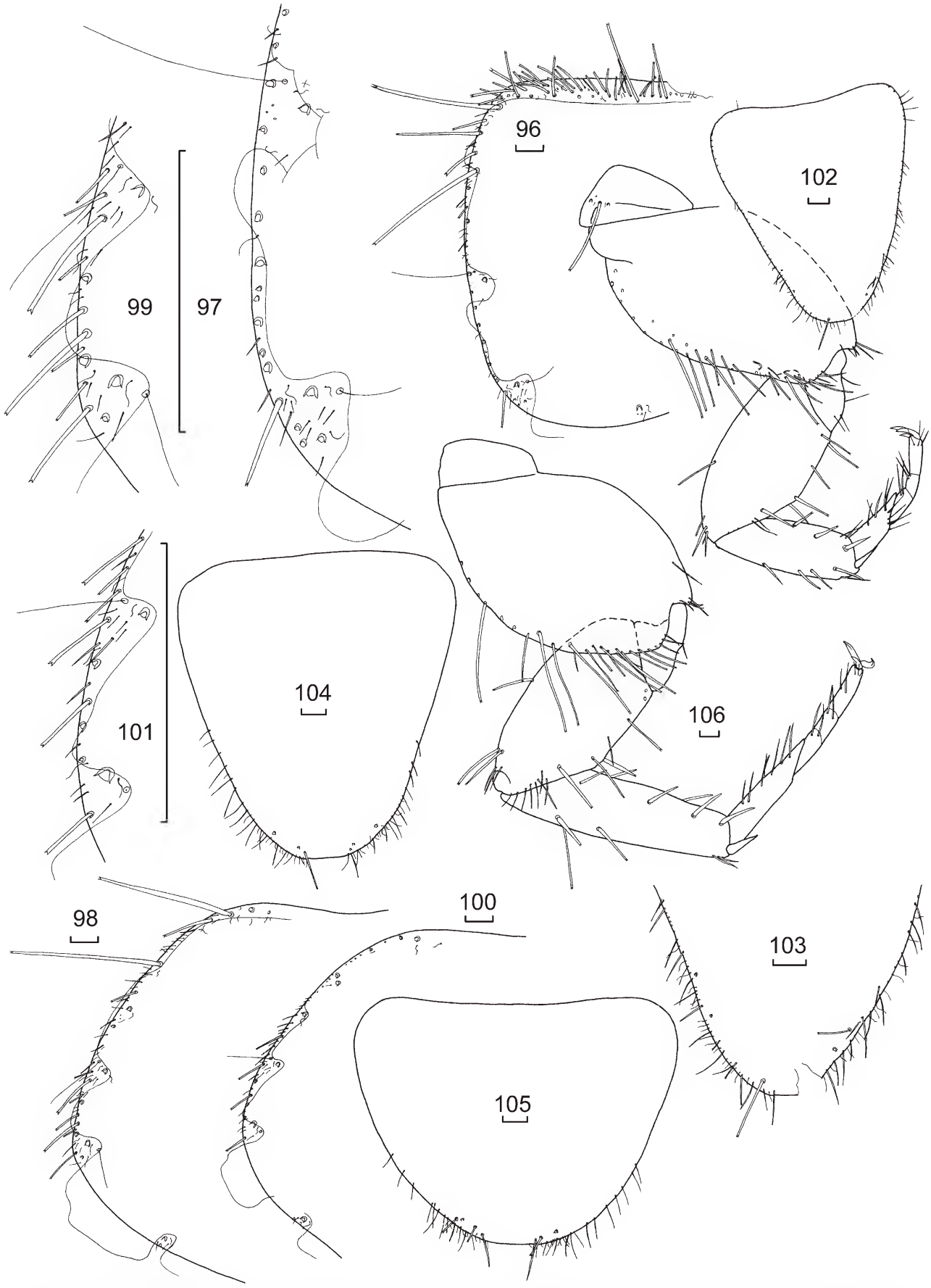
S. Bunton, pyrethrum spray to bark of Eucalypt (with ants of the genus *Ochetellus* Shattuck, 1992); juvenile ♀ (HW 0.83) (K377648 in alcohol) same data as previous; ♀ (HW 1.49) (K377649 in alcohol) same data as previous; ♀ (HW 1.30) (K377650 in alcohol) same data as previous; ♀ (HW 1.33) (K377651 in alcohol) same data as previous; ♀ (HW 1.23) (K377652 in alcohol) same data as previous; juvenile ♀ (HW 0.95) (K377653 in alcohol) same data as previous; juvenile ♀ (HW 0.98) (K377654 in alcohol) same data as previous; juvenile ♀ (HW 0.80) (K377655 in alcohol) TAS: Douglass-Apsley NP, Apsley Gorge nr. car park, 41.86509°S 148.18993°E, 111 m asl, 20.xii.2011, G. Smith and S. Bunton, pyrethrum spray to end of rotting log; ♀ (HW 1.30) (K261114 K261115 on two slides) TAS: Wyemans River-Bluemans Creek State Reserve, 42.01506°S 147.95835°E, 322 m asl, 21.xii.2011, G. Smith and S. Bunton, under bark of Eucalypt; ♀ (HW 1.20) (K377656 in alcohol) same data as previous; ♀ (HW 1.13) (K377657 in alcohol) same data as previous; juvenile ♀ (HW 0.95) (K377658 in alcohol) same data as previous; juvenile ♀ (HW 0.90) (K377659 in alcohol) same data as previous; ♀ (HW 1.30) (K261116 K261117 on two slides) TAS: High point on road between Bicheno and Campbell Town, 42.02539°S 147.76409°E, 629 m asl, 21.xii.2011, G. Smith and S. Bunton, under bark of *Eucalytpus obliqua* L'Her.; ♀ (HW 1.33) (K377660 in alcohol) same data as previous; ♀ (HW 1.50) (K377661 in alcohol) same data as previous; ♀ (HW 1.23) (K377662 in alcohol) same data as previous; ♀ (HW 1.20) (K377663 in alcohol) same data as previous; ♀ (HW 1.13) (K377664 in alcohol) same data as previous; ♀ (HW 1.00) (K377665 in alcohol) same data as previous; juvenile ♀ (HW 0.90) (K377666 in alcohol) same data as previous; juvenile ♀ (HW 0.95) (K377667 in alcohol) TAS: above St Peters Pass rest area, 42.24176°S 147.40593°E, 373 m asl, 21.xii.2011, G. Smith and S. Bunton, under bark; juvenile ♀ (HW 0.68) (K377668 in alcohol) same data as previous; ♀ (HW 1.33) (K261110 K261111 on two slides) TAS: Mt Stuart lookout, 42.87437°S 147.29574°E, 247 m asl, 22.xii.2011, G. Smith and S. Bunton, under bark of dead tree; ♀ (HW 1.25) (K377669 in alcohol) same data as previous; ♀ (HW 1.10) (K377670 in alcohol) same data as previous; ♀ (HW 1.28) (K377671 in alcohol) same data as previous, ♀ (HW 1.05) (K377672 in alcohol) same data as previous; ♀ (HW 1.10) (K377673 in alcohol) same data as previous; juvenile ♀ (HW 1.00) (K377674 in alcohol) TAS: Steppes (central highlands), 42.11°S 146.89°E, 844 m asl, 1.vii.2012, S. Bunton.

Diagnosis. No other adequately described species of *Heterolepisma* is reported to have 3+3 combs on urotergite I, urosternites II–VIII with 1+1 single macrochaetae and two pairs of styli in the ♀ but only one pair in the ♂.

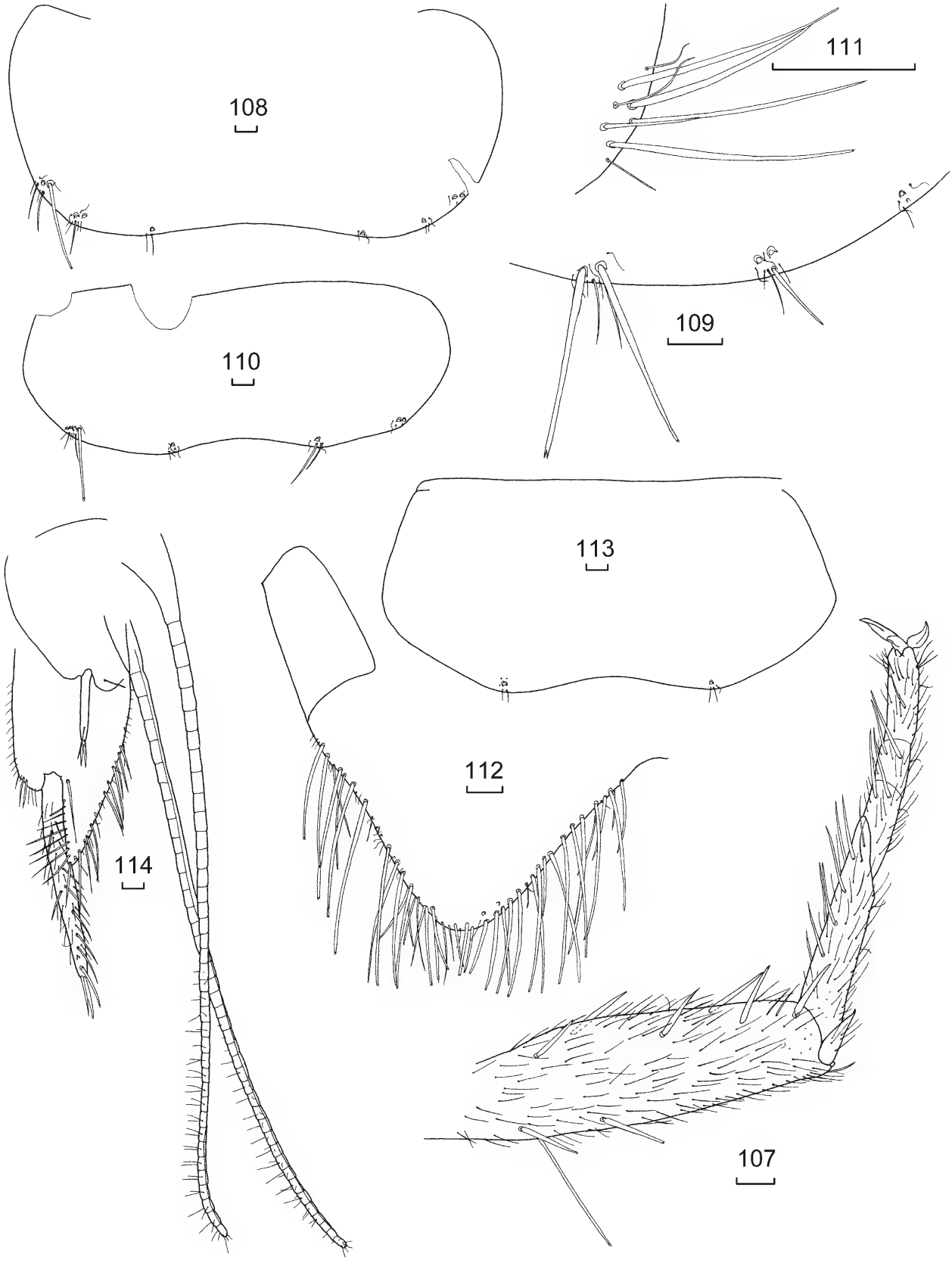
Description. *Appearance*. Medium to large silverfish, scale covering in life uniform or slightly mottled grey with light brownish antennae, nota with lighter lateral margins, terminal filaments distinctly banded (Fig. 79).

Body length. H+B up to 10.25 mm (♀) 8.65 mm (♂); maximum HW 1.50 mm; thorax: length up to 3.45 mm (or 0.28–0.35 H+B); width up to 2.20 mm with no great difference between the pro, meso- and metanota; maximum preserved length of antenna 6.3 mm (or 0.69 H+B); terminal filaments damaged in most specimens, maximum preserved length of apparently intact cercus 6.13 mm (or 0.76 H+B); maximum preserved length of median dorsal appendage 9.30 mm (or 0.95 H+B). Body neither elongate nor broad (Fig. 80) with thorax slightly wider than abdominal segment I, the following abdominal segments about the same width until the fourth or fifth after which it tapers posteriorly.

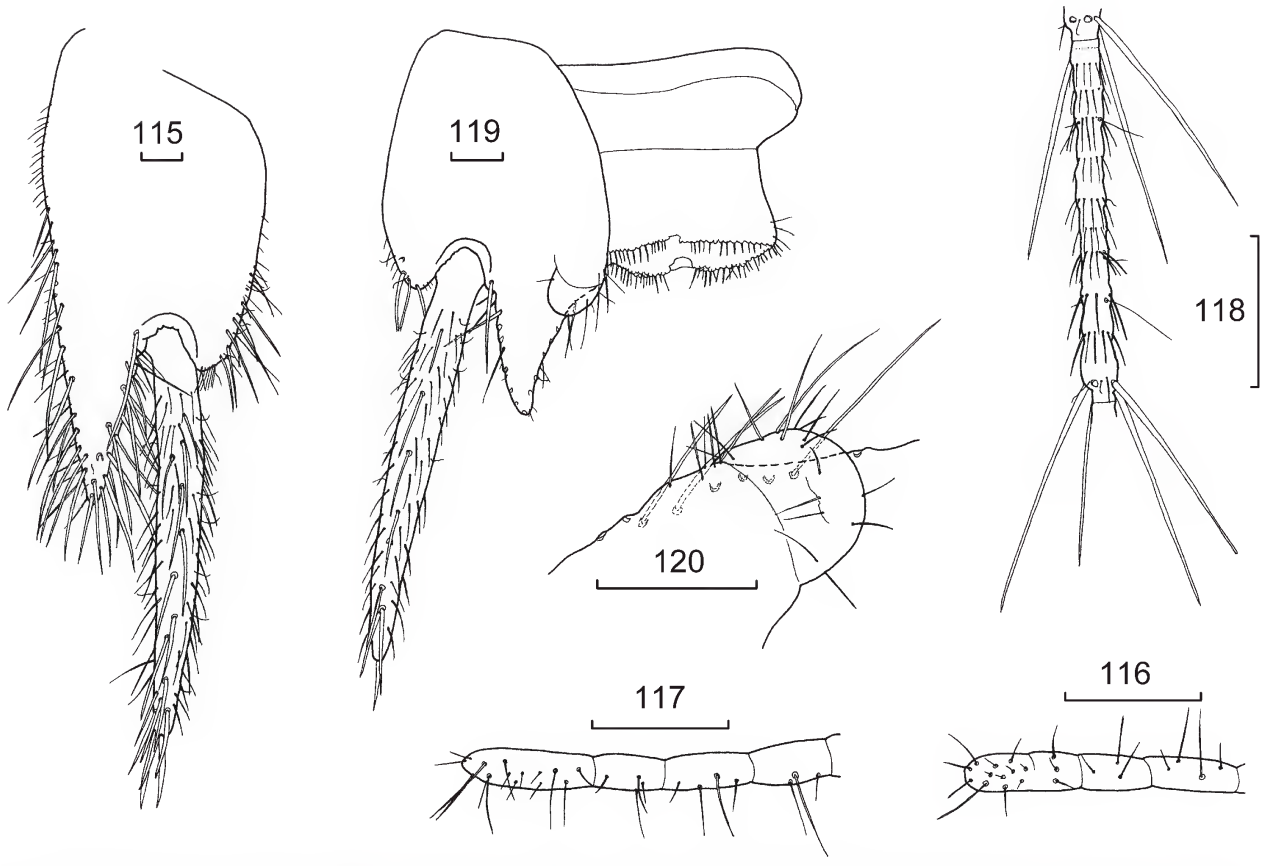
Pigmentation. Pigment brown in alcohol preserved specimens but fades somewhat in slide mounted material. Pigment laterally on head especially behind the antennae and surrounding the eyes with bands across the frons between the antennae, the distal half of clypeus and labrum; pedicel and



Figures 96–106. *Heterolepisma buntonorum* n.sp. ♀ holotype *(96)* pronotum with outline of limit of scales; *(97)* idem, trichobothrial areas; *(98)* mesonotum with outline of limit of scales; *(99)* idem, trichobothrial areas; *(100)* metanotum with outline of limit of scales; *(101)* idem, trichobothrial areas; *(102)* prosternum and PI; *(103)* idem, apex of prosternum; *(104)* mesosternum; *(105)* metasternum; *(106)* PIII. Scale bars = 0.1 mm.



Figures 107–114. *Heterolepisma buntonorum* n.sp. ♀ holotype *(107)* PIII tibia and tarsus; *(108)* urotergite I; *(109)* urotergite VII, chaetotaxy of left side; *(110)* urotergite VIII; *(111)* urotergite IX, right infralateral chaetotaxy; *(112)* urotergite X; *(113)* urosternite VI; *(114)* genital region with styli, coxites VII and IX, anterior and posterior valves of ovipositor. Scale bars = 0.1 mm.



Figures 115–120. *Heterolepisma buntonorum* n.sp. ♀ holotype unless otherwise indicated by specimen number; *(115)* coxite IX of ♀ with chaetotaxy of stylus; *(116)* apex of anterior gonapophysis; *(117)* apex of posterior gonapophysis; *(118)* cercus, most distal surviving division; *(119)* coxite IX of ♂ (K261013), penis and paramere; *(120)* idem, apex of paramere. Scale bars = 0.1 mm.

scape quite darkly pigmented, rest of flagellum uniformly lightly pigmented; all articles of maxillary palp strongly pigmented with denser pigmentation of articles two and three but less on the ultimate article especially apically; all articles of labial palp with strong pigmentation except for apex and distal half of face bearing papillae; pronotum with pigmentation along anterior margin and anterolateral corners as well as along lateral margins, meso- and metanota pigmented laterally; legs with pigmentation along outer edge of precoxa, along the length of the outer margin and distally on the inner margin of the coxa, trochanter with patch on margin distally, femur completely pigmented and darkest along inner margin and at apex of outer margin, tibia and first tarsal article evenly darkly pigmented with pigment becoming lighter on more distal tarsal articles, urotergite X dark around margins, coxites IX and styli IX pigmented, divisions of terminal filaments dark except for a distinctly unpigmented annulus at the distal end of each division around the rosette of large macrochaetae. Some individuals show greater or lesser levels of pigmentation, with less pigmentation in juvenile specimens.

Macrochaetae. Bifid apically, with longitudinal ribs and grooves when examined with SEM (Fig. 92) or smooth, hyaline or brown (Fig. 81) when examined with light microscope.

Scales. Unevenly rounded or ovoid, with numerous parallel ribs, that do not extend beyond the margin; in alcohol dorsal scales and the more lateral scales of the urosternites with dark brown ribs (much darker in their apical half) (Fig. 82); ventrally mostly hyaline. Lanceolate scales were not observed.

Head. Wider than long and with chaetotaxy typical of the genus (Fig. 83) i.e. marginal rows about two macrochaetae wide along the sides of the vertex, and a complete anterior row (i.e. no gap in the middle), the lateral rows extending back along the margin to the eyes and extending as a single short row of about six macrochaetae above the eyes and also below the eyes, as well as a small group extending sub-perpendicular to the margin at the level of each antenna; clypeus with numerous setae, some long and thin, and 1+1 combs of 4–6 macrochaetae proximally at the lateral ends of the suture with the frons; labrum with many long thin setae. Scales on top of head only. Eyes dark. —Antennae (Figs 84–86) long, the more apical intervals with rare or inconspicuous rod-like basiconic sensillae near the apex of each annulus (Fig. 93) as well as a small trichobothrium subapically on each interval. —Mandibles (Figs 87, 88) typical for genus with well-developed molar and incisor areas; a group of about eleven strong and six finer apically bifurcated setae distally adjacent to the pectinate molar area and a bush of 40+ setae and macrochaetae externally. —Maxilla (Figs 89, 90) with three large macrochaetae externally proximal to the palp, the lacinia with three strong teeth, one shorter than the rest, seven lamellate processes and a row of seven apically bifurcate setae, apical article of maxillary palp 1.5–3.6 times longer than wide and 0.8–1.7 times longer than penultimate article, the ultimate article in

both sexes with three "branched" papillae. —Labium (Fig. 91) short and broad with rows of strong bifurcated setae on the prementum, submentum with numerous long thin setae as well as 2+2 stronger setae laterally near the suture with the prementum, glossae and paraglossae quite broad with short curved setulae; labial palp short, apical article eccentric suboval, about as long as wide (L/W 1.0–1.2) with 2+3 papillae of compact type (Fig. 94) and at least one curved club-like thin-walled basiconic sensilla.

Thorax. Pronotum (Figs 96, 97) with wide setal collar of shorter and longer, apically bifurcated setae and macrochaetae as well as cilia, not arranged in distinct rows but about two or three macrochaetae wide; lateral margins also with numerous shorter and longer setae and some cilia, each side with several larger submarginal macrochaetae; trichobothrial areas open and in contact with the lateral margins, the anterior one slightly posterior to the mid-point along the margin usually with one large macrochaeta located mediad to the trichobothrium and several setulae (in one specimen K261012 the large macrochaetae are absent on both sides, on another K261114 it is missing on the right side but present on the left, and vice versa on specimen K261112); posterior trichobothrial area near posterior lateral corner with two submarginal macrochaetae as well as several setulae and a few cilia, the trichobothrium located in the most mediad position; posterior margin slightly concave with 1+1 combs each of one macrochaeta with a smaller seta between it and the margin and 1–3 cilia and/or setulae. —Mesonotum (Figs 98, 99) lacking anterior notal collar, lateral chaetotaxy similar to pronotum with the submarginal macrochaetae single in most cases, although in some specimens (e.g., K261012) one comb or two combs (K261116) are composed of two macrochaetae, the anterior trichobothrial areas located more posteriorly at about ⅔ of the distance along the margin, with the trichobothrium located between the macrochaeta and the margin and slightly anterior to the macrochaeta. —Metanotum (Figs 100, 101) similar to mesonotum except posterior margin slightly more concave and the submarginal combs in the middle of the lateral margin are more likely to be composed of two macrochaetae (although on ♀ K261014 the comb of two macrochaetae is only present on the left side and another ♀ K261016 only on the right side anterior to the midpoint); the two most anterior submarginal macrochaetae may also lie quite close together almost appearing as another comb.

Presternum narrow, with transverse row of strong setae. —All thoracic sterna with hyaline scales. Prothoracic sternum large, only slightly longer than wide at its base and reaching almost to the end of the coxa, rounded apically (Figs 102, 103), full length of lateral margins with numerous small marginal setae and cilia, 1+1 larger apically bifurcate macrochaetae distally near the margin as well as another three or four smaller submarginal macrochaetae on each side in the distal third, distinct combs absent. —Mesosternum (Fig. 104) slightly longer than broad with marginal setae and cilia in distal half as well as 2+2 smaller subdistal macrochaetae and 1+1 larger macrochaetae slightly anterior to these. —Metasternum (Fig. 105) more rounded, distinctly wider than long with marginal setae and cilia along the distal half of the lateral margins, 1+1 longer subapical simple macrochaetae between which the margin is largely glabrous and two or three subdistal submarginal apically bifurcate macrochaetae.

Legs fairly long (Figs 102, 106), tibia L/W ratio of legs PI 2.5–3.4, PII 2.6–3.8, PIII 2.4–5.0; tarsi L/W ratio PI 4.9–7.8, PII 4.9–8.0, PIII 6.3–11.5. PI with transverse comb of about three macrochaetae laterally on the precoxa. Coxa with some scales and with strong macrochaetae in two rows along the external margin, a stout macrochaeta and some long fine setae on the inner margin subapically and group of about four or five stout curved macrochaetae at the apex over the articulation. Trochanter and femur lacking scales, femur with several strong macrochaetae ventrally and dorsally three smaller setae subdistally and one about ⅔ of the way along the margin, in addition to the fine setae over the surfaces. All tibia with four or five strong macrochaetae ventrally and another stout macrochaeta on face subapically; tibia of PI and PII with three stout macrochaetae near the outer margin. Tibia of PIII (Fig. 107) with only two macrochaetae near the dorsal margin (more distal macrochaeta absent), as well as a long thinner, laterally projecting apically bifurcate macrochaeta, which is about 1.2 times longer than the tibia is wide (longer on the juvenile K377675 being almost as long as the tibia), located near the more proximal macrochaeta. Tarsus with four articles. Pretarsus with long curved lateral claws and a strong curved shorter medial claw (Fig. 107).

Abdomen. Urotergites I–VII with 3+3 combs of macrochaetae as in Table 1 (Figs 108, 109) noting that the macrochaeta was sometimes missing from one of the submedial combs; each comb also associated with 0–3 marginal setae, 0–5 setulae plus 1–4 cilia (e.g., Fig. 109). Urotergite VIII (Fig. 110) with 2+2 combs, lacking the sublateral comb; urotergite IX (Fig. 111) with one to five long thin infralateral setae on each side as well as a few setulae and one or two cilia. Urotergite X not very long, apically rounded, similar in both sexes (Fig. 112), L/W at base about 0.6 with many strong setae along entire margin, 1+2 submarginal setae in posterolateral corners but not obviously stronger than other setae.

Urosternite I glabrous, urosternites II–VIII with 1+1 single macrochaetae (Fig. 113) each associated with 0–1 marginal seta as well as a few cilia and/or setulae. Coxites of segment VIII in ♀ (Fig. 114) with group of several fine setae on the rounded corners on each side of the stylus insertion. Styli in two pairs in the ♀ (VIII–IX); all styli with at least three noticeably longer and stronger setae apically (Fig. 115). Styli IX almost three times as long as styli VIII and much more robust.

Table 1. *Heterolepisma buntonorum* n.sp. number of macrochaetae per bristle comb.

Segment	Urotergite			Urosternites
	Lateral	Sublateral	Submedial	
I	2	1–2	1	—
II	1–2	1–2	1	1
III	2	2	0–1	1
IV	3	2	1	1
V	3	2	0–1	1
VI	3	2	1	1
VII	2	2	1	1
VIII	2–3	—	1	1
IX	1–5[a]	—	0–2	—

a infralateral setae.

Coxite IX of ♀ (Fig. 115), the internal process acute apically, about 3.7 times longer than the external process and 1.6–1.9 times as long as broad at its base, reaching to about 40% of the length of the stylus; external and internal margins of internal process and external margin of outer process with many moderately strong setae directed both up and down as well as a large seta adjacent to the base of the stylus, apex of outer process with several small setae. —Ovipositor long and very thin (up to 2.55 HW), surpassing the apex of stylus IX by almost twice the length of the stylus (excluding terminal macrochaetae), composed of about 38–42 divisions. Distal divisions of gonapophyses VIII and IX (Figs 116, 117) with only short fine setae and setulae.

Cerci (Fig. 95) with divisions from second small, several times wider than long gradually becoming longer, equally wide as long by the sixth division after which they become even longer with more annuli each with a rosette of setae and trichobothria although the large macrochaetae are restricted to the most distal annulus of each division; the most distal surviving divisions (Fig. 118) with up to eleven annuli. —Medial filament of similar arrangement but subdivision occurs slightly more distad to that on the cerci.

Male. As for female except only one pair of styli (segment IX). Coxites IX (Fig. 119) with acute inner process about 1.2 times longer than wide at its base and about three times longer than the more rounded external process, reaching to about 35% of the length of the stylus. Parameres small, longer than wide, with about 20 fine setae (Fig. 120). Penis typical for genus with numerous glandular setae apically, each set on a protuberance.

Subadult stages. the smallest juvenile ♀ specimens examined, K377637 (HW 0.58) and K377668 (HW 0.68) have the division of urosternite VIII visible but not appearing to be complete, styli IX present but not fully developed, with no indication of styli developing on urosternite VIII and urotergite X short and semicircular. Older juvenile ♀♀ K377643 (HW 0.78), K377641 (HW 0.83), K377624 (HW 0.85), K377636 (HW 0.85) have the division of urosternite VIII appearing complete and the development of stylus VIII has usually started with one or both coxites showing a notch where the stylus will develop and the stylus is represented by a small round or triangular process with large differences in development often seen between the left and right sides of an individual; urotergite X approaching normal adult shape; in one of these specimens a feathered papilla of the maxillary palp was clearly visible. On slightly older females, K377642 (HW 0.88) and K377630 (HW 0.93) styli VIII are represented by obvious triangular processes but the ovipositor was not developed. In the specimen K377631 (HW 0.95) the developing ovipositor just surpasses the end of the internal processes of coxite IX. In females K377660 (HW 1.13) and K377657 (HW 1.13) the ovipositor is almost fully developed, surpassing the apex of styli IX by about 1.5 times the length of the stylus.

Parameres were not visible in the males K377625 (HW0.79) and K377626 (HW 0.80) but were visible in males K377629 (HW 1.00) and K377628 HW (1.04).

Etymology. The species is named for my good friends Steve and Kathy Bunton who collected on my behalf and organised the trip during which most of this material was collected.

Habitat. *Heterolepisma buntonorum* appears be fairly widespread in south-eastern Tasmania. Specimens were collected within cracks in the bark or under layers of bark of both living and dead *Eucalyptus* trees, possibly in abandoned termite galleries, and also from dry leaf litter accumulated beneath a rock overhang.

Remarks. *Heterolepisma kraepelini*, in the few characters adequately described (e.g., shape of ultimate article of labial palp, shape of the metasternum), appears to be similar but differs in the number of pairs of styli (three in the ♀ of *H. kraepelini*, two in the ♀ of *H. buntonorum*) and the much longer ovipositor in *H. buntonorum*.

This genus now has 24 described species and will no doubt become much larger with further work. Determination of the following character states has been useful in grouping Australian specimens into species or species groups:

- presence or absence of a medial "comb" on urosternite I
- chaetotaxy of urosternites II–VII (1+1 single macrochaetae versus 1+1 combs of 2–7 macrochaetae)
- chaetotaxy of urotergite I (1+1, 2+2 or 3+3 combs)
- number of pairs of styli (IX only in both sexes, IX in ♂ VIII–IX in ♀, VIII–IX in both sexes, VII–IX in ♀ VIII–IX in ♂, VII–IX in both sexes, VI–IX in both sexes, V–IX in both sexes, V–IX in ♀ VI–IX in ♂, IV–IX in both sexes).

Subfamily Ctenolepismatinae Mendes, 1991

Ctenolepisma Escherich, 1905

Ctenolepisma Escherich, 1905: 75.
Peliolepisma Ritter, 1910: 380.

Type species. *Lepisma lineata* Fabricius, 1775 by subsequent designation of Paclt, 1967: 38 on the grounds of priority.

Ctenolepisma (Ctenolepisma) longicaudata Escherich, 1905

Fig. 121

Ctenolepisma longicaudata Escherich, 1905: 83.
?Lepisma transcaucasica Nasanov, 1886: 307, nomen nudum, and Nasonov, 1887: 26. Secondary source: Paclt, 1967: 45.
?Lepisma leai Ridley, 1890: 557.
Ctenolepisma tavaresi Navás, 1906: 156.
Lepisma ciliata dives Silvestri, 1908c: 144.
Ctenolepisma urbana Slabaugh, 1940: 95.
Ctenolepisma longicaudata coreana Uchida, 1943: 224.
Ctenolepisma pinicola Uchida, 1964: 367.
Ctenolepisma longicaudatum Escherich.—Paclt, 1966: 152
Ctenolepisma lingicaudatum Escherich.—Paclt, 1979: 223 [lapsus calami].
Ctenolepisma (Escherichisma) longicaudatum Escherich.—Kaplin, 1993: 46.

Material examined. ♀ (HW 1.93) (K377675 in alcohol) TAS: Hobart, Raymont Terrace, Mt Stuart, 42.87243°S 147.30582°E, 167 m asl, S. Bunton, in house; ♀ (HW 1.95) (K377676 in alcohol) TAS: Hobart, Pirie St, New Town, 42.859°S 147.307°E, 43 m asl, S. Bunton, in house.

Figure 121. *Ctenolepisma longicaudata* Escherich, Narraweena, Sydney.

Remarks. This anthropophilic species is widespread throughout the tropical and temperate regions of the world, living in and around human habitations. The author is not aware of this species having been found living in the wild anywhere in the world. Lindsay (1940) examined its biology, Heeg (1967a) its water economy and (1967b) its reaction to temperature, light and atmospheric humidity.

Acrotelsella Silvestri, 1935

Stylifera Stach, 1932: 333, 345 *pro parte*.
Acrotelsella Silvestri, 1935: 307.

Type species. *Acrotelsa producta* Escherich, 1905 by original designation.

Acrotelsella parlevar n.sp.

Figs 122–163

Type material. Holotype ♀ (HW 1.55) (K261103 K261104 on two slides) TAS: Travellers Rest, near Launceston, 41.49103°S 147.07778°E, 17–23 April 2015, W. and L. Clarkson, pitfall trap, dry sclerophyll forest. Both antennae of the holotype broken off above scape but there were four loose antennae in the original tube which also contained a specimen of another species (described below). There is little doubt that the correct antennae have been paired with the correct specimens due to the absence of poculiform sensillae in *Acrotelsella* species and their obvious presence in the other species and its nearest relative from Barrow Island. Similarly all styli of this species were lost but at least one stylus loose in tube is believed to be stylus IX of this species as it is much longer than the remaining stylus on the second species.

Diagnosis. This species can easily be distinguished from other described *Acrotelsella* by the presence of only three papillae on the last article of the labial palp, the shape of the thoracic sterna and the arrangement of the sternal combs in over-lapping subparallel rows.

Description. *Appearance*. Medium to large silverfish, with narrow body, thorax not much wider than the abdomen which only tapers slightly posteriorly (Fig. 122). Scale pattern when live unknown, in alcohol mottled brown. Head covered with light brown scales; eyes dark chestnut, thorax and abdomen dorsally fairly evenly covered in brown scales.

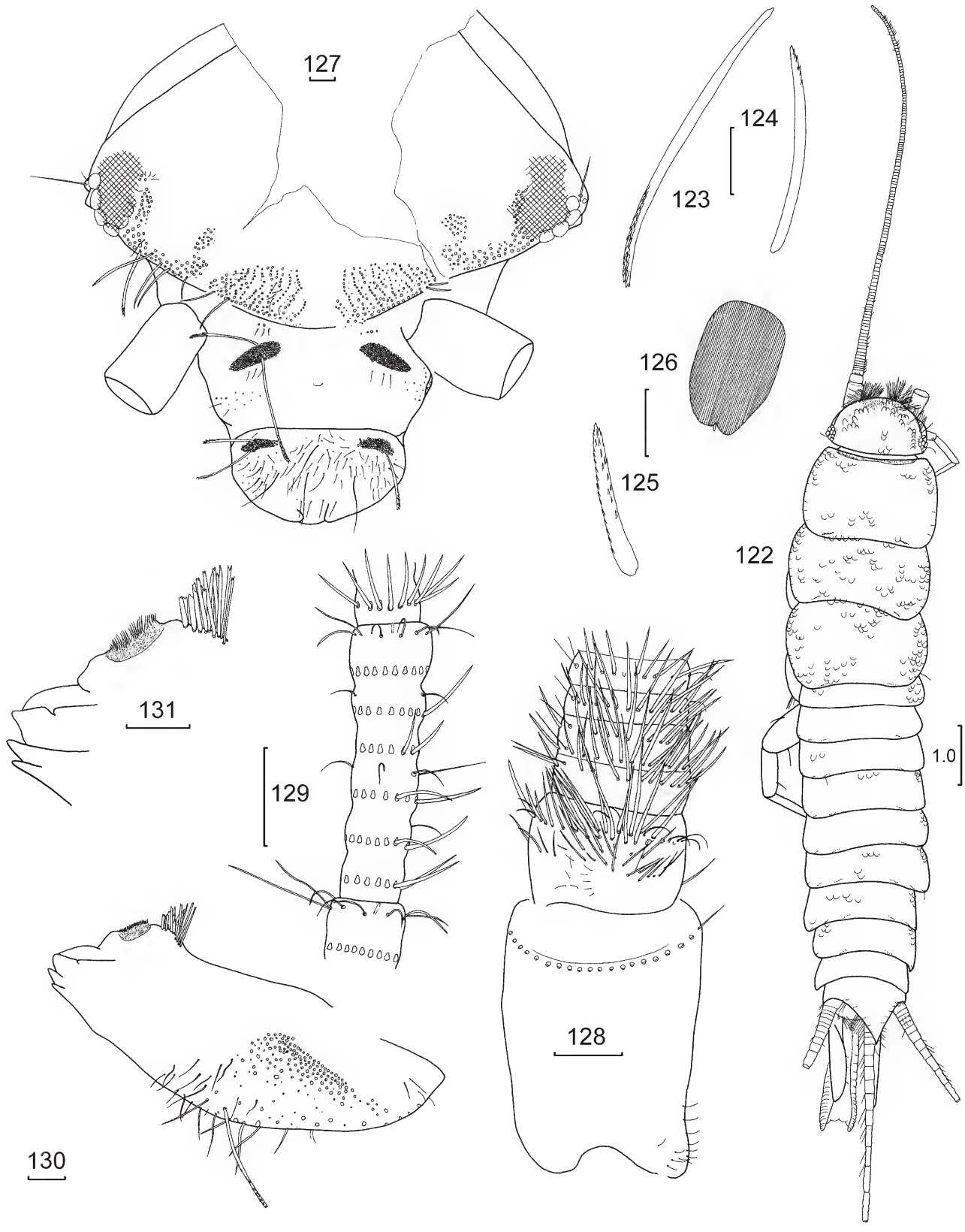
Body length. H+B 10.7 mm (♀), HW 1.55 mm; thorax: length 3.5 mm or one third H+B; width 2.15 mm with the pronotum being slightly narrower than the meso- and metanota, mesonotum slightly longer than pronotum and shorter than metanotum; antennae incomplete, maximum preserved length 7 mm or >0.66 H+B; terminal filaments all broken, maximum length of cercus 1.8 mm or >0.17 H+B; median dorsal appendage maximum length 3.75 mm (>0.3 H+B).

Pigmentation. Antennae pigmented brown along entire length. Frons with reddish brown pigment on sides and extending somewhat in front of the isolated sublateral groups of macrochaetae, and a little around the eyes, scape with reddish brown pigment distally and along mediad face, mandibles, maxillae and labium without pigment, maxillary palp with pigment on articles two, three and four becoming increasingly darker, ultimate article not as dark, especially at both ends; labial palp with very little pigment, just a small amount apically on the margin of the penultimate article and faintly on the distal article, prothorax with pigmentation on anterior corners but not along the notal collar, thoracic sternites without pigment, legs with brown pigment on shoulder of coxae, posterior margin of trochanter, over face of femur and noticeably stronger on the margins especially distally, the tibia and basal article of tarsi with even, somewhat orange pigment, pinkish pigment on inner process of coxites IX, ovipositor without pigment, cerci and median filament evenly light.

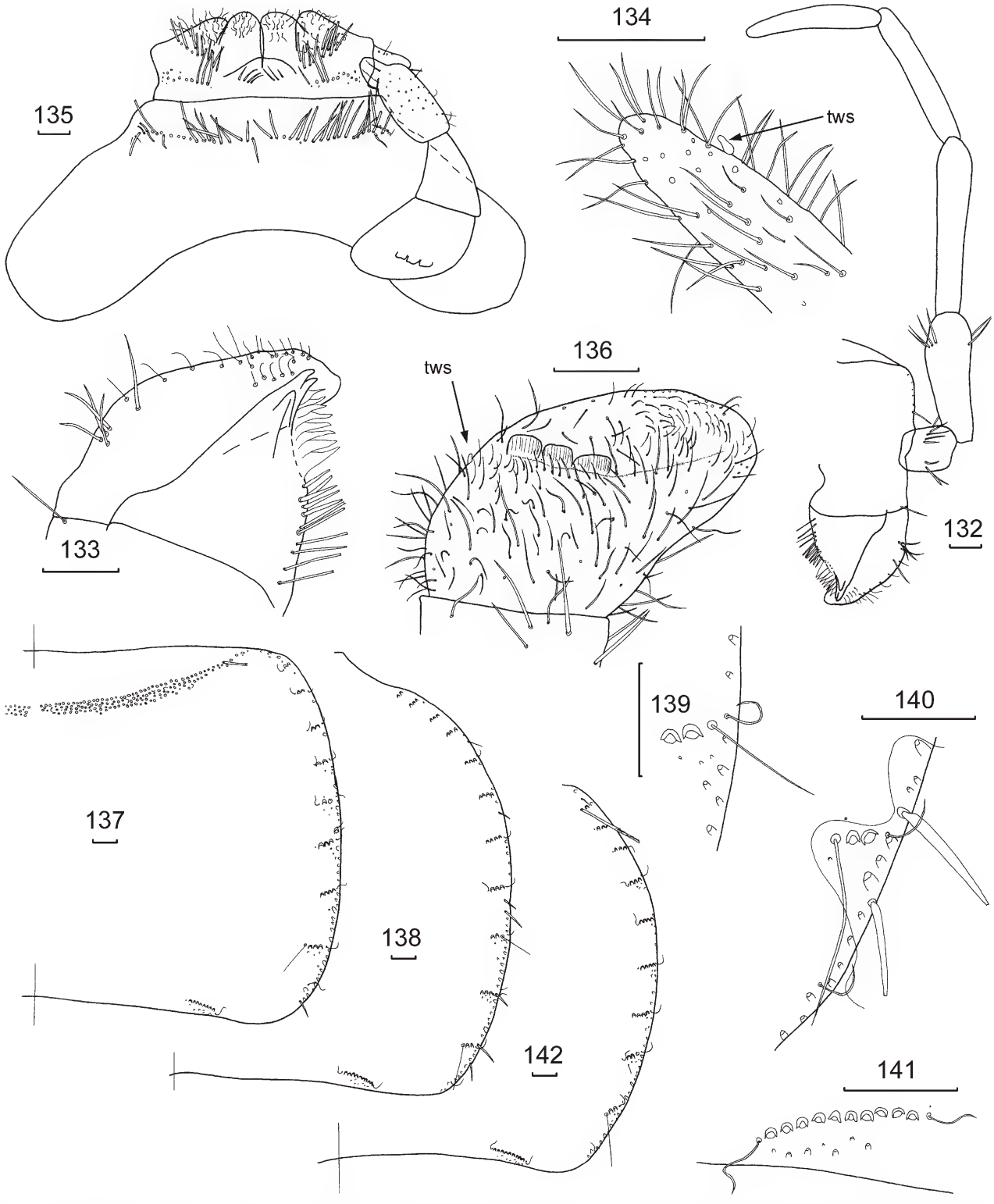
Macrochaetae. Variable, pectinate or smooth (Figs 123–125), hyaline to light brown.

Scales. With numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 126), those dorsal brown, those ventral hyaline. Scales found on top of head, on scape, on second article of maxillary palp, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli IX, medial filament and possibly also the cerci.

Head. (Fig. 127) wider than long, with 1+1 not very dense bushes of macrochaetae aligned in subparallel rows on the anterolateral corners. There is a small gap in the row of macrochaetae along the margin above the antennal bases after which there is another bush of weakly pectinate to smooth macrochaetae, three or four macrochaetae wide

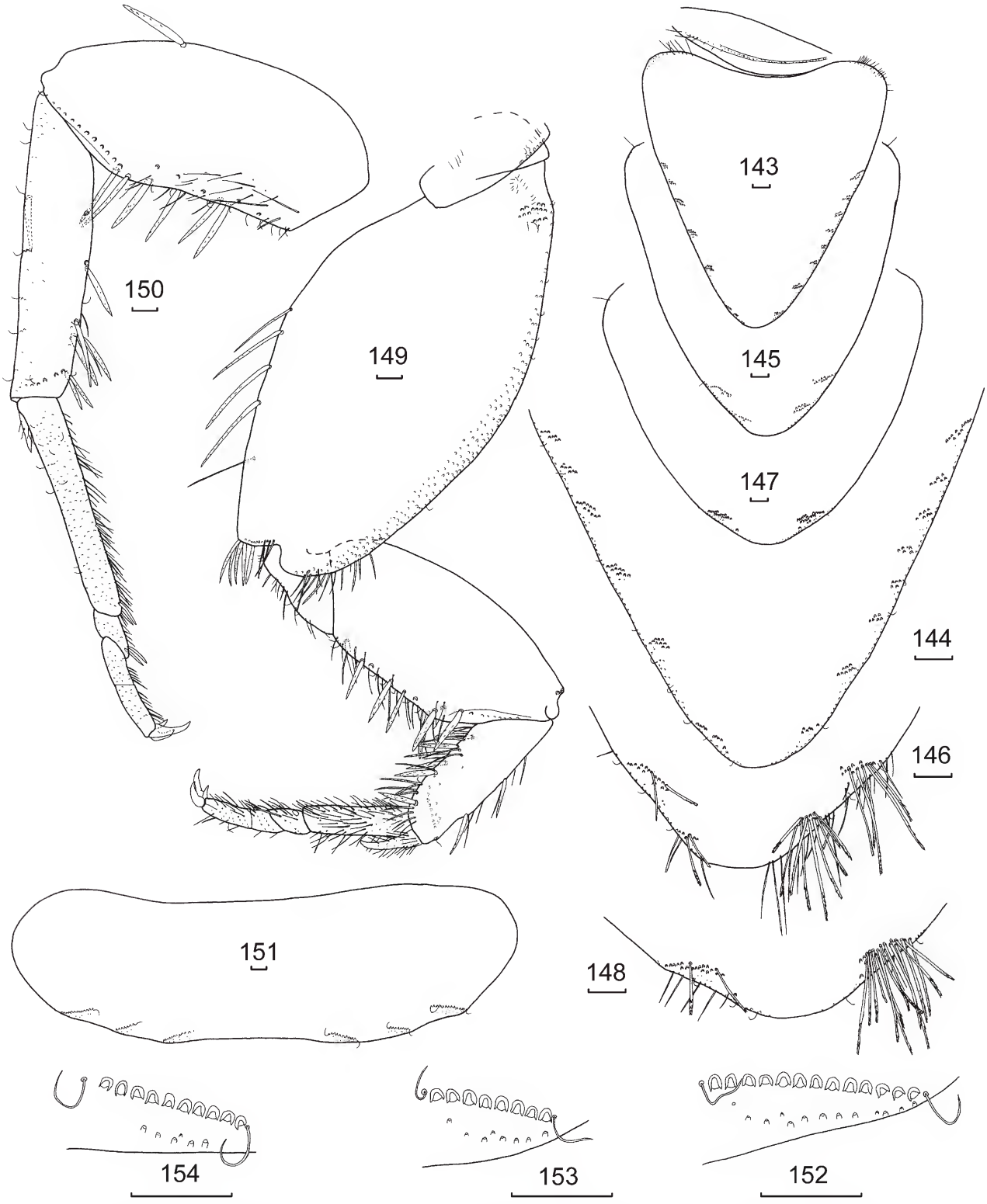


Figures 122–131. *Acrotelsella parlevar* n.sp. holotype ♀ *(122)* habitus with separated antennae drawn as if attached; *(123)* long pectinate macrochaeta of clypeus; *(124)* finely pectinate macrochaeta of side of head; *(125)* carrot-shaped finely pectinate macrochaeta of tibia of PIII; *(126)* darker dorsal scale; *(127)* head (cross-hatched area obscured by eye pigment); *(128)* antenna, scape, pedicel and basal intervals of flagellum (graphically reconstructed joining loose antennae to scape); *(129)* idem, most distal surviving complete interval; *(130)* mandible; *(131)* idem, molar and incisor region. Scale bars = 0.1 mm unless otherwise indicated.



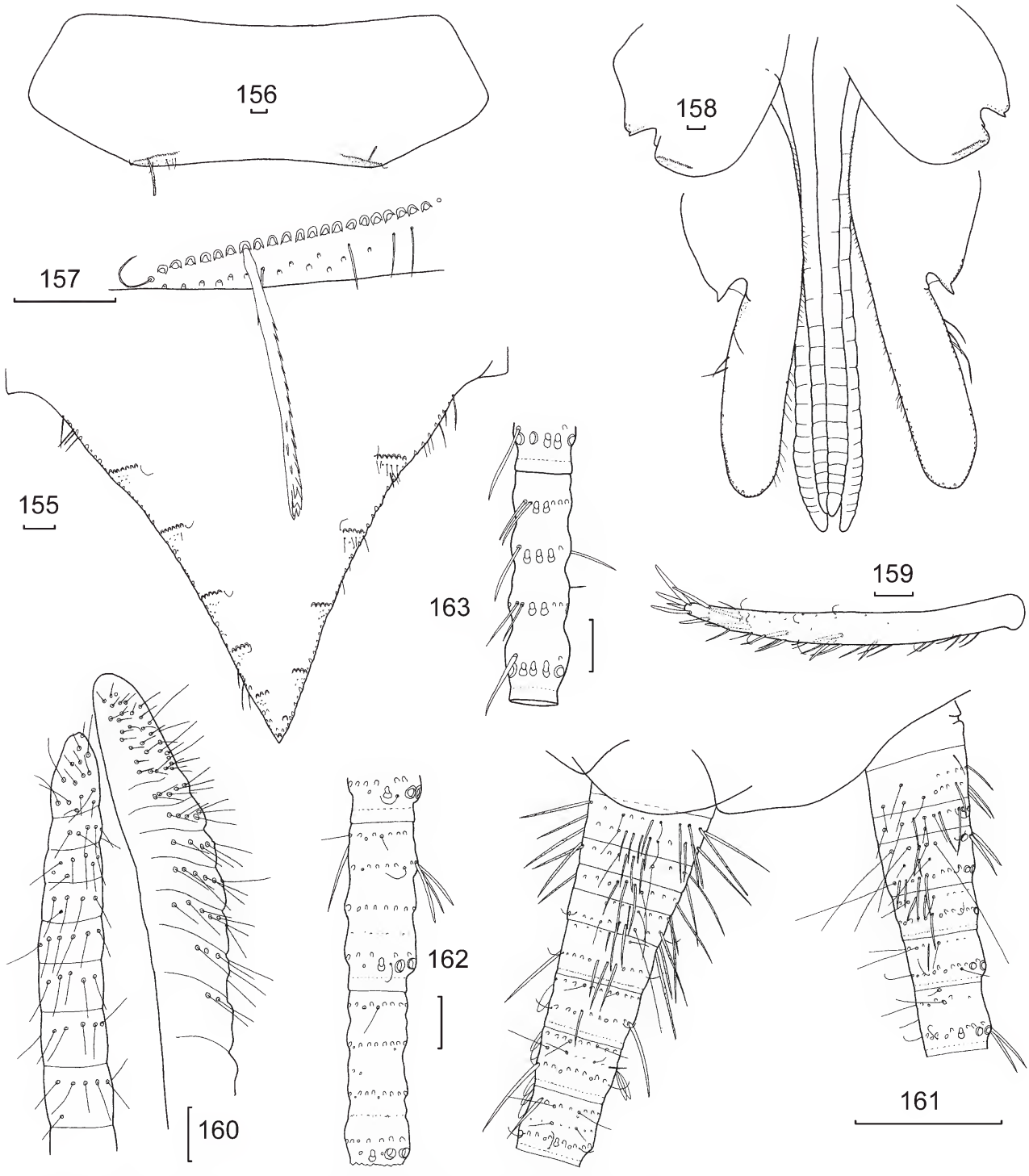
Figures 132–142. *Acrotelsella parlevar* n.sp. holotype ♀ *(132)* maxilla; *(133)* idem, lacinia and galea; *(134)* idem, apex of ultimate article of palp; *(135)* labium; *(136)* idem, ultimate article of palp showing location of thin-walled sensilla *(tws)*; *(137)* pronotum; *(138)* mesonotum; *(139)* idem, anterior trichobothrial area; *(140)* idem, posterior trichobothrial area with fine line delineating extent of scale coverage; *(141)* idem, left posterior comb; *(142)* metanotum. Scale bars = 0.1 mm.

extending along the sides and above the eye; the normally isolated group behind the antennae is almost connected with the lateral bushes. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as a few curved setae laterally. Labrum also with 1+1 dense bushes of pectinate macrochaetae as well as many simple setae and three longer thin setae. Eyes dark chestnut brown. —Antennae fairly long, scape (Fig. 128) quite long with scales over surface and a preapical rosette of numerous setae; pedicel with preapical rosette of simple setae and cilia with two close rows of setae in places as well as setae scattered over face; first annulus/interval of flagellum with a subapical rosette of



Figures 143–154. *Acrotelsella parlevar* n.sp. holotype ♀ *(143)* presternum, prothoracic sternum; *(144)* combs of prosternum; *(145)* mesothoracic sternum; *(146)* combs of metasternum; *(147)* metathoracic sternum; *(148)* combs of metasternum; *(149)* PI; *(150)* PIII; *(151)* urotergite VII; *(152)* idem, right lateral comb; *(153)* idem, right sublateral comb; *(154)* idem, right submedial comb. Scale bars = 0.1 mm.

simple setae and probably two trichobothria; next annulus with two rosettes of simple setae each probably with two trichobothria; subsequent intervals with single rosette of setae and cilia across the middle of the annulus and two short trichobothria per annulus. Intervals of flagellum subdivided from the seventh interval. Distally the intervals are subdivided into six annuli (Fig. 129) with the most distal annulus bearing a proximal rosette of setae and a subapical rosette of cilia, a trichobothrium and probably some rod-like basiconic sensillae. —Mandibles (Figs 130, 131) typical for *Acrotelsella* with well-developed molar and incisor areas; a group of about fifteen strong apically bifurcated but simple



Figures 155–163. *Acrotelsella parlevar* n.sp. holotype ♀ *(155)* urotergite X; *(156)* urosternite VI; *(157)* idem, right lateral comb; *(158)* coxites VIII and IX with ovipositor; *(159)* stylus IX; *(160)* apex of gonapophyses; *(161)* base of cerci and medial filament; *(162)* cercus, most distal surviving division; *(163)* medial filament, most distal surviving division. Scale bars = 0.1 mm.

setae distally adjacent to the pectinate molar area and a bush of about 120 macrochaetae externally as well as scattered simple setae and pectinate macrochaetae. —Maxilla (Fig. 132) with some thick minutely apically bifurcated but otherwise smooth macrochaetae externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by about eight lamellate processes and a row of eleven thin simple setae, those nearest the lamellate processes shorter and conical in shape, galea slightly longer than lacinia with about five strong, smooth, simple or apically bifurcate setae externally in its basal half and several cilia distally (Fig. 133); maxillary palp very long and thin, apical article (Fig. 134) five to six times longer than wide and 0.9 times as long as the penultimate article which is 0.87 times as long as the third and longest article, the ultimate article with a thick sausage-shaped sensilla subapically (thin-walled basiconic sensillae of Adel 1984), last three articles of palp with fine setae only, basal article with oblique rosette of thicker setae, second article also with subapical rosette of slightly thicker setae. —Labium (Fig. 135) short and broad,

postmentum with transverse row of apically bifurcate setae, prementum with transverse and oblique rows of short strong apically bifurcated setae, apically with long curved setulae; labial palp short, apical article expanded medially (Fig. 136), a little shorter than long (0.80–1.00) with row of only three papillae of compact type arranged in a single row near the outer margin, with at least one thin-walled basiconic sensillae and some rod-like basiconic sensilla on the outer margin, covered with numerous fine setae as well as longer fine setae.

Thorax. Pronotum (Fig. 137) with dense setal collar about three to four macrochaetae wide, with very slight gap medially, all macrochaetae lost except a few at the lateral ends which are short and slightly pectinate; lateral margins with a few setae along the margin (all macrochaetae lost except one which is short and slightly pectinate), these marginal setae almost absent from the anterior part of the margin, becoming more frequent posteriorly, with eight combs of two to three macrochaetae along each margin (all lost except one from the most anterior comb of the metanotum which is strongly pectinate). Two open trichobothrial areas; the posterior trichobothrial area is located about ¾ of the distance along the margin and is associated with the last comb (=N using terminology of Molero-Baltanás *et al*, 2010), this comb composed of three macrochaetae with the short trichobothrium at the mediad end and a cilium at the laterad end, the anterior trichobothrial area is slightly forward of the midpoint and associated with comb N-3, the comb composed of only a single macrochaeta with the trichobothrium between the macrochaeta and the margin and a cilium at the mediad side of the macrochaeta; all combs associated with a few setulae. Posterior margin with 1+1 combs of eight macrochaetae associated with several setulae between the comb and the margin and a cilium at the mediad end. —Mesonotum (Fig. 138) with lateral chaetotaxy similar to pronotum with ten combs of two to four macrochaetae, the anterior trichobothrial area (Fig. 139) located a little more than half way along the lateral margin associated with comb N-2 composed of two macrochaetae with the trichobothrium located between the macrochaeta and the margin, with one to three setulae posterior to the comb and a cilium between the trichobothrium and the margin. Posterior trichobothrial area (Fig. 140) slightly more posterior than that on the pronotum, the trichobothrium located mediad to the comb of two macrochaetae and with one to three setulae posterior to the comb. Posterior margin with quite laterad 1+1 combs (Fig. 141) of nine to ten macrochaetae with cilia at each end and several setulae between the comb and the margin. —Metanotum (Fig. 142) similar to mesonotum with nine or ten combs of two to four macrochaetae, the anterior trichobothrial area associated with comb N-1 of two macrochaetae about two thirds the distance along the margin, the posterior trichobothrial area associated with the most posterior comb and the posterior 1+1 combs each of nine macrochaetae with a cilium at each end and several setulae between the comb and the margin.

Presternum narrow, with transverse row of setae (Fig. 143). —Prothoracic sternum (Fig. 143) large, almost as long as the coxa, 1.1 times as long as wide at its base, parabolic, rounded apically, anterolateral corners with fields of about 40 simple small setae, those on the margins finer than those submarginal, posterior three quarters of lateral margins with fringe of setae and some cilia as well as seven to eight short combs each composed of four to twelve setae mostly arranged in two to three overlapping rows (Fig. 144). —Mesosternum (Figs 145, 146) a little larger than prosternum (1.1 times as long) and slightly less acute apically, a little longer than wide at its base, with a few fine setae in the anterolateral corners and long, thin simple marginal setae along the posterior quarter of the margin and 2+2 combs distally, the more anterior composed of 13–16 pectinate macrochaetae in two rows, the more posterior composed of seven to eleven pectinate macrochaetae also in two rows. —Metasternum (Figs 147, 148) of similar size to mesosternum except wider, apically rounded, the margins slightly concave adjacent to the posterior combs, about 1.2 times wider than long wide with marginal setae and cilia along distal sixth of lateral margins and 1+1 groups of 18–19 pectinate macrochaetae arranged in three or four overlapping rows plus 1+1 single submarginal macrochaetae more distally.

Legs quite long and slender, tibia L/W ratio of legs PI 3.1, PII 3.1, PIII 4.4; tarsi L/W ratio PI 7.0, PII 6.8, PIII 11.7. PI (Fig. 149) with a row of setae laterally on the distal margin of the precoxa. Coxa with scales and a group of about fifteen macrochaetae on the anterolateral corners followed by a field of strong pectinate macrochaetae along the external margin; inner margin with a four lightly pectinate macrochaetae and numerous smooth and pectinate setae of varying thickness distally over the articulation. Trochanter with a few setae. Femur posteriorly with nine (?) strong, thick slightly pectinate carrot-shaped macrochaetae, in addition to simple setae along the margin and just a few on the dorsal surface towards the distal end. Tibia of PI with about six stout, carrot-shaped, slightly pectinate macrochaetae along the posterior margin as well as several longer, thinner, pectinate or smooth setae and a row of shorter setae near the distal margin; anterior margin with two pectinate macrochaetae as well as about two subdistal macrochaetae over the articulation, dorsal surface with a subdistal row of setae; apex of tibia with the usual apical spur which is covered in numerous setae. Tarsi with four articles, the basal article of PI about half the total length of the tarsus, its join with the next article not particularly oblique, the surface of all tarsal articles with numerous simple setae, the second article on both PI legs appearing to have a raised oval area basally (perhaps an artefact or a sensilla). Pretarsus with two long curved lateral claws and a shorter curved medial claw. PII and PIII (Fig. 150) similar to PI except the anterolateral groups of macrochaetae on the coxa reduced to about seven setae in two rows; legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer, being about two thirds of the total length on PIII.

Abdomen. Urotergite I with 1+1 lateral combs of eight to nine macrochaetae each associated with a cilium at either end and several setulae between the comb and the margin, urotergites II–VII with 3+3 combs of macrochaetae as in Table 2 (Figs 151–154), urotergite VIII with 2+2 combs (lacking the sublateral), urotergite IX glabrous; all combs with a cilium at either end and a similar number of setulae as macrochaetae between the comb and the margin. Urotergite X (Fig. 155) acutely triangular, slightly wider at base than long (L/W 0.80) with many setae along entire margin both above (all lost) and below (small, simple), and 5+4(5) combs of one to six macrochaetae per comb (all lost) as well as several setulae posterior to each comb, and most combs with a cilium at the mediad end.

Table 2. *Acrotelsella parlevar* n.sp. number of macrochaetae per bristle comb.

Segment	Urotergite			Urosternite
	Lateral	Sublateral	Submedial	
I	8–9	—	—	—
II	7–8	6	8–10	—
III	8	6–7	9–10	16–18
IV	10–11	7–8	10–11	19–21
V	12	7–8	10–11	19–20
VI	12–13	7	9–10	21
VII	12–13	7–8	10–11	19–20
VIII	13	—	10–11	18
IX	—	—	—	—

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 16–21 pectinate macrochaetae (Figs 156, 157) each with 11–19 setulae between the comb and the margin as well as a cilium at each end of every comb. The distance between the lateral combs 2.7–4.6 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Fig. 158. Two pairs of styli, those on IX long and slender with robust setae apically and along the length of the stylus (Fig. 159), styli of VIII lost. Coxites VIII with long combs of 18 macrochaetae and a similar number of setulae between the comb and the margin, the coxites with rounded inner corners. Coxites IX with long rounded internal process, about 3.7 times longer than wide at its base and almost eight times longer than the short pointed external process, the inner processes not quite reaching the apex of the ovipositor; outer process with setulae along the inner margin and several setae externally, inner process with several long smooth setae along the outer margins as well as finer setae or setulae and many scales, inner margin of process with setae insertions (all setae lost) and many small setae or setulae. —Ovipositor (Figs 158, 160) not very long (up to 1.9 HW), only just surpassing the apex of the long internal processes of coxites IX, both pairs of gonapophyses consisting of longer basal divisions becoming progressively shorter distally, about twenty divisions in total; of primary type with rows of fine setae on each article (Fig.160).

Cerci (Figs 161, 162) first division glabrous, following five basal divisions shorter than wide then progressively longer with increasing numbers of rosettes of setae, macrochaetae and many trichobothria; most distal surviving division (twelfth) with four annuli each with a strong rosette; scales not observed on cerci but most setae and macrochaetae have been lost so scales may also have been lost. —Median dorsal appendage (Figs 161, 163), first division glabrous, following divisions with rosettes of setae and trichobothria, formed into four annuli by thirteenth until at least the last surviving division (17th), scales present on some basal divisions (e.g., 7th, 8th, 9th).

Male. Unknown.

Habitat. Both this specimen and that of the following species were collected in a single pitfall trap in an area described as dry sclerophyll forest dominated by *Eucalyptus viminalis*, and *E. amygdalina* and *Exocarpos cupressiformis* with a grassy understorey (*Poa* and *Themeda*). The soil was very rocky.

Etymology. The species is named *parlevar*, one English language spelling of the name (treated as noun) of the indigenous occupants of Tasmania at the time Europeans first arrived.

Remarks. With seven described and numerous undescribed species, the genus *Acrotelsella* is well represented in Australia, especially in the warmer regions. The genus is also known from south-east Asia, India and China, the Seychelles, Kenya, Madagascar, Somalia, Saudi Arabia, Hawaii, French Polynesia, Central and northern South America (Colombia, Venezuela, Ecuador and Panama) and the Caribbean. This record is by far the most southerly for the genus. The mean annual rainfall is 703 mm, the monthly summer maximum temperature (for Launceston) is about 25°C and the mean winter minimum is 2.3°C.

The systematics of the genus is poorly understood and it will be necessary to describe many more species before a coherent phylogeny emerges. John Irish (pers. comm.), examined a range of specimens borrowed from various Australian museums and noted a group of species with only three papillae on the last article of the labial palp. *Acrotelsella parlevar* has this feature as do several other species collected by the current author and they may prove to be a distinct group within *Acrotelsella*.

Hemitelsella n.gen.

Type species. *Acrotelsella transpectinata* Smith, 2015.

Diagnosis. Medium-sized silverfish. Body shape as in Fig. 164. Pigment present. Macrochaetae variably plumose. Scales multiradiate of variable shape as well as lanceolate. Antennae with both poculiform and rod-like basiconic sensillae. Chaetotaxy of frons consisting of weak bushes of pectinate macrochaetae in the anterolateral corners between the antennae, with the macrochaetae not aligned in distinct rows, with a small gap between this group and further marginal macrochaetae running along the lateral margin and above the eyes; with small 1+1 isolated groups of macrochaetae posterior to the antennal bases. Clypeus and labrum each with 1+1 bushes of pectinate macrochaetae. Eyes of 12 ommatidia.

Apical article of labial palp with long row of sensory papillae. Pronotum with narrow setal collar. Thoracic nota each with several lateral bristlecombs and 1+1 posterolateral combs of one or two macrochaetae positioned quite laterad; all trichobothrial areas open (type 1 of Mendes, 1986) and each associated with a bristlecomb. Thoracic sternites subtriangular to broadly parabolic with posterolateral bristlecombs. Tibiae with many long strong pectinate macrochaetae. Tarsi with four articles all with round-tipped setae below, pretarsus with two claws and a medial empodial claw. Urotergite I with 1+1 and II–VII each with 3+3 bristlecombs, urotergite VIII with 2+2 bristlecombs (lacking the sublaterals), IX glabrous. Urotergite X short, subtriangular with many marginal macrochaetae and with submarginal bristlecombs. Urosternites I–II glabrous and III–VIII with 1+1 bristlecombs. Coxites IX in both sexes with transverse bristlecombs across the inner process. One pair of styli only (IX). Parameres absent. Penis typical for family; large, two segmented, apically with many short glandular setae each set on a protuberance. Cerci with both broad and lanceolate scales.

Female, in the one species where it is known, with secondary type ovipositor with apical spines.

Etymology. The genus is close to *Acrotelsella* Silvestri but carries only half the number of styli. The name is composed of the Greek prefix "hemi" meaning half combined with—*telsella*. It is treated as grammatically feminine.

Remarks. Short transverse combs on coxites IX have previously been reported for several species of *Ctenolepisma (Sceletolepisma)* Wygodzinsky, 1955 *sensu* Irish, 1987 including *C. albid*a Escherich, 1905, *C. guadianica* Mendes, 1992, *C. maroccana* Mendes, 1980, *C. serranoi* Mendes, 1985, *C. silvestrii* Stach, 1946, *C. luederitzi*, Irish, 1987, *C. namibensis* Irish, 1987, *C. placida* Irish, 1987 and *C. spinipes* Irish, 1987. Several of these species are not that different to species of *Ctenolepisma (Sceletolepisma)* without such combs (Mendes pers. comm.) and hence the presence of such combs may not be of high taxonomic importance. In the case of *Hemitelsella*, these combs are much more substantial and the inner processes of the coxites quite wide rather than elongated. *Hemitelsella* would appear to be closely related to *Acrotelsella* Silvestri with which it shares the same dorsal chaetotaxy and shape of urotergite X, however in the chaetotaxy of the head, the rounded tipped setae on the tarsi and the sensillae of the distal antennal intervals it would appear to be closer to species of *Qantelsella* Smith, 2015.

Hemitelsella clarksonorum n.sp.

Figs 164–204

Type material. Holotype ♂ (HW 1.18) (K261105 K261106 K261107 on three slides) TAS: Travellers Rest, near Launceston, 41.49103°S 147.07778°E, 17–23 April 2015, W. and L. Clarkson, pitfall trap, dry sclerophyll forest. Note that the antennae, excluding the scape, of both this specimen and that of the previous species were loose in the same tube. Given the colouring and the presence of large poculiform sensillae on the antennae (as in the closely related *Hemitelsella transpectinata*) there is little doubt that the antennae have been matched with the correct species. This may not be the case for a leg and the styli mounted on the same slide.

Diagnosis. This species can easily be distinguished from *Hemitelsella transpectinata* (Smith) by the elongate shape of the ultimate article of the labial palp, the arrangements of combs on the thoracic sternites and the scale pattern of the head (lacking hyaline scales around the margin).

Description. *Appearance*. Medium sized silverfish, with narrow body, thorax not much wider than abdomen which only tapers slightly posteriorly from about the fifth abdominal segment; appearance when live unknown, in alcohol reddish brown. Head uniformly covered with brown scales, without wide areas of hyaline scales along the sides and front of the head; thorax also fairly evenly covered in brown scales although those along the posterior margin are larger and darker, abdomen with two longitudinal darker stripes formed by dark chestnut to black scales, along the first five segments with lighter coloured scales between and outside the lines, with a distinct patch of white scales in the posterior lateral corner of all segments, but larger and more conspicuous on segments II–VI, the lines merge together by the sixth segment to give an almost overall darker covering with the exception of the posterolateral white patches (Fig. 164); eyes dark chestnut brown.

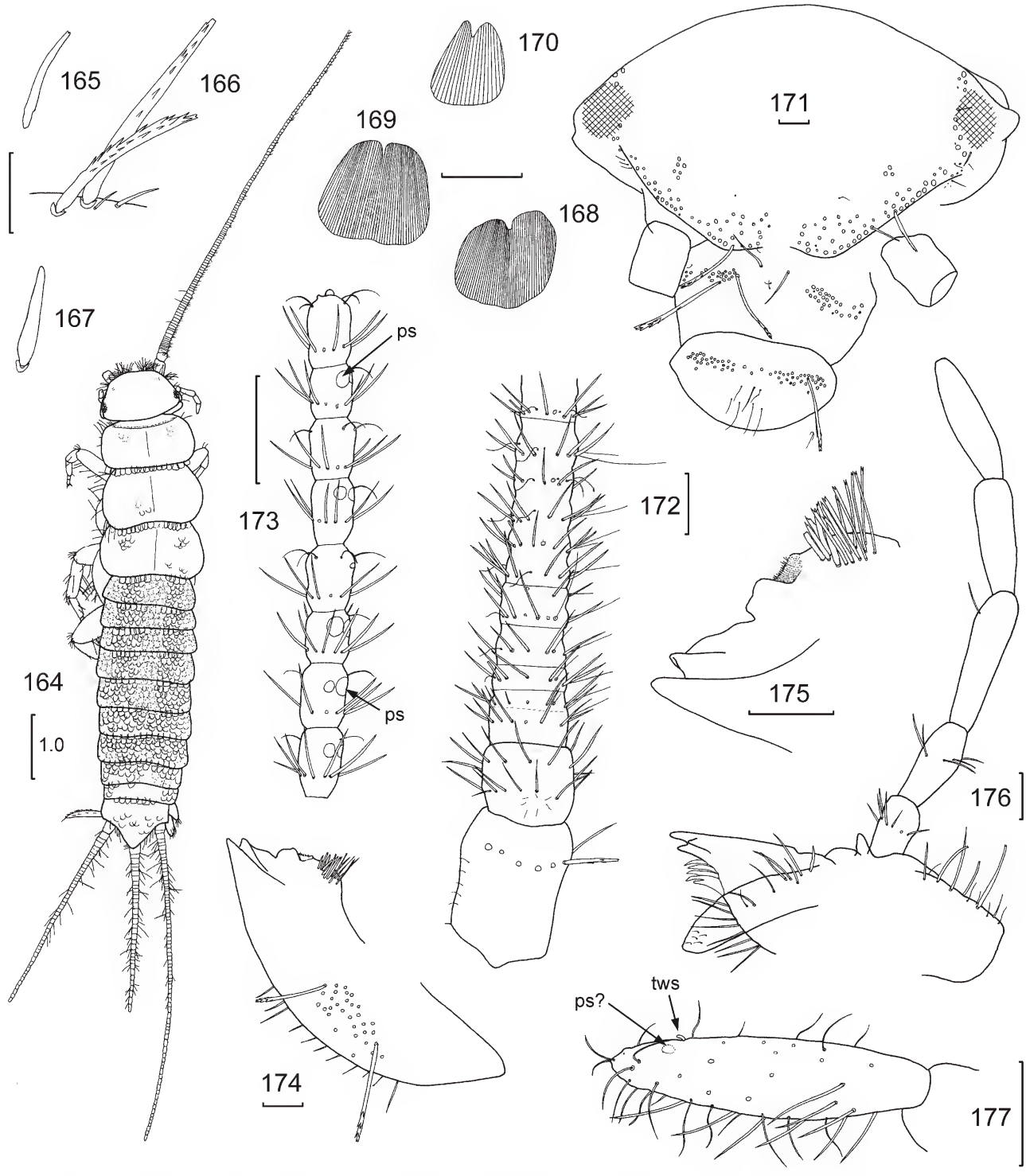
Body length. H+B 7.15 mm; HW 1.18 mm; thorax: length 2.35 mm or 0.33 H+B; width up to 1.48 mm with no great difference between the pro, meso- and metanota although the metanotum is the widest and the pronotum the narrowest, pronotum slightly shorter than meso- or mesonota; antenna almost complete, 6.0 mm or 0.85 H+B; terminal filaments all incomplete, maximum length of cercus remaining 5 mm or 0.7 H+B; maximum length of median dorsal appendage remaining 3.0 mm or 0.42 H+B.

Pigmentation. Body overall with a reddish brown appearance due to a reddish granular layer beneath the cuticle which easily peels away from it during dissection. Top of head evenly brown, scape brown, body of mandibles, maxillae and labium evenly pigmented, maxillary palp with pigment on all articles, somewhat less in distal articles, labial palp with very little pigment, just a bit more noticeable laterally on the distal article, legs with brown/orange pigment stronger towards outer margins and on distal end of all articles including tarsomeres; prothorax with more pigmentation along notal collar, all nota, urotergites and sternites appear to be evenly pigmented due to underlying reddish granular layer, penis with pigment around base and sides, pigment much less on inner process of coxites IX, styli without pigment, cerci and median filament evenly brown, the cerci darker than the median filament.

Macrochaetae. Pectinate and of variable form (Figs 165–167), mostly hyaline but some on the tibia, as well as the rounded tip macrochaetae of the tarsi are more strongly sclerotized and darker, straw coloured or slightly brown.

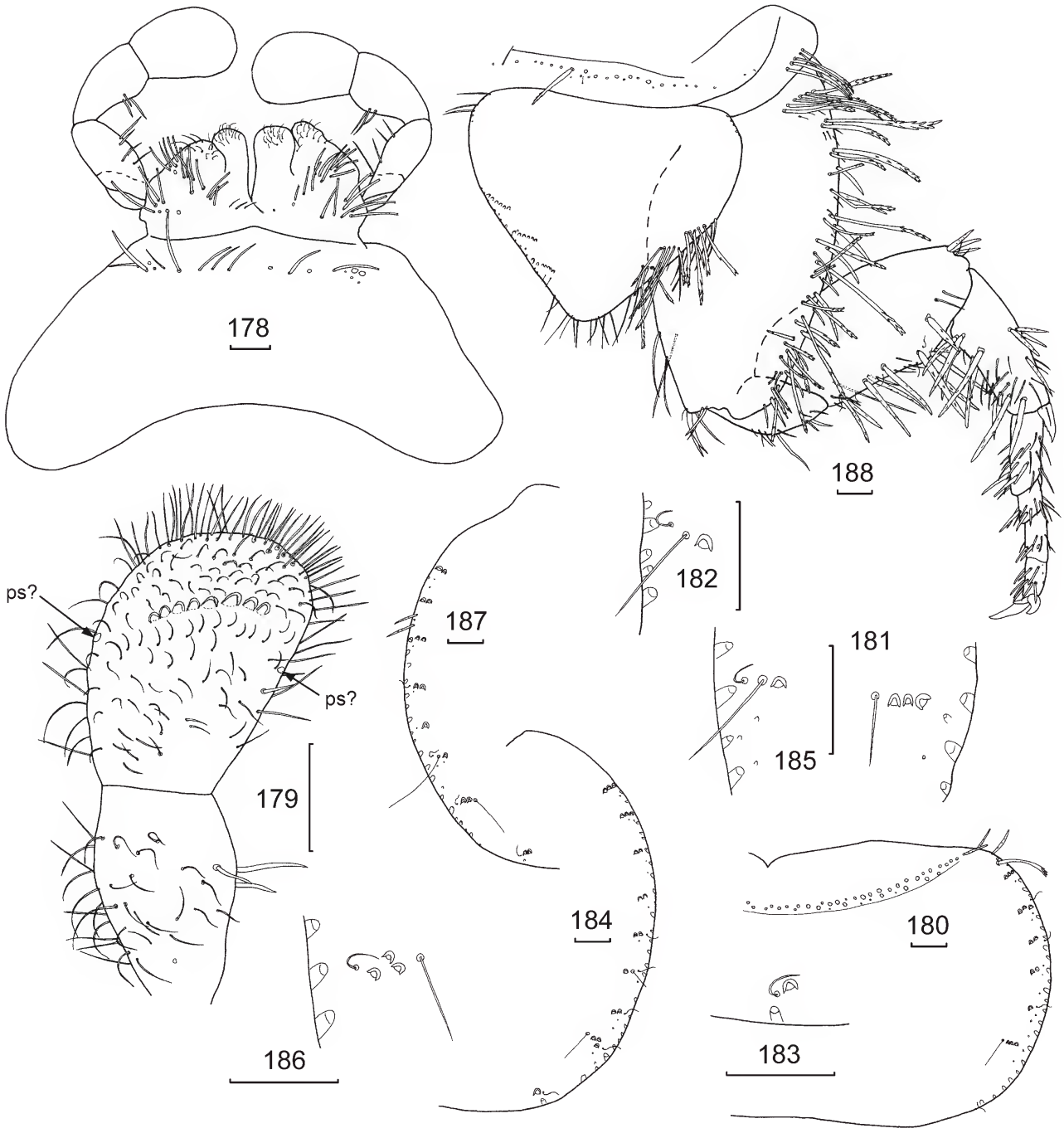
Scales. With numerous subparallel ribs that do not surpass the margin of the scale but which can be quite different in their spacing (Figs 168–170); hyaline scales with rays a little further apart than those of darker scales; shape of scales generally round, although the posterior margin can be quite straight for those scales overhanging the posterior margins of the tergites and others are shaped to fit around setae or combs. Scales found on top of head, base of mandibles, on scape, all nota, all thoracic sterna, legs but appear to be absent from trochanter and tarsi (except possibly the basal article of the tarsus of PIII), present on all urotergites and urosternites, styli and on parts of the terminal filaments. Scales of the terminal filaments very diverse in shape including some very broad as well as lanceolate scales.

Head. Wider than long (Fig. 171), with 1+1 weak bushes of pectinate macrochaetae on the anterolateral corners, not very dense and not aligned in distinct rows. The gap along the margin above the antennae is very indistinct after which the marginal row continues about two to three macrochaetae wide to the level of the eyes and then running above the eyes with a small group of three or four macrochaetae above and behind the eyes. The small isolated 1+1 groups of macrochaetae posterior and mediad to the antennal base consist of only three to six macrochaetae without any associated cilia or long thin setae; 1+1 isolated single cilia are found anterior to and mediad to these groups. Clypeus with 1+1 bushes of about 20–25 macrochaetae as well as 1+1 setae between the groups. Labrum also with 1+1



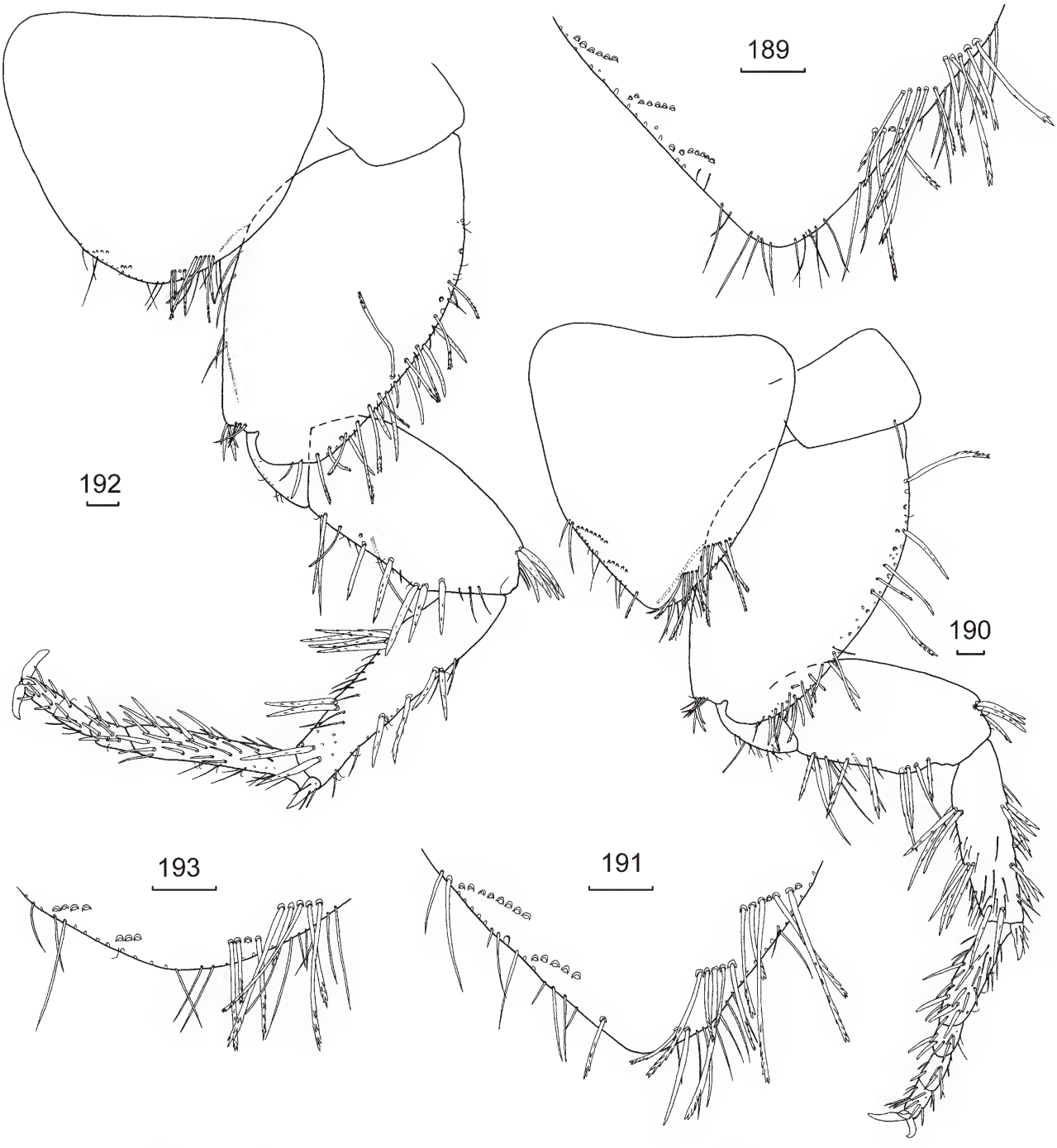
Figures 164–177. *Hemitelsella clarksonorum* n.sp. holotype ♂ *(164)* habitus, with loose antennae drawn as if attached; *(165)* smooth, apically bifurcate seta of prementum; *(166)* pectinate macrochaetae of coxa of PIII; *(167)* round-tipped macrochaeta from apex of tibia of PIII; *(168)* darker scale from face of pronotum; *(169)* darker scale from margin of pronotum; *(170)* hyaline scale from mesonotum; *(171)* head (cross-hatched area obscured by eye pigment; *(172)* antenna, scape, pedicel and basal intervals of flagellum (graphically reconstructed joining loose antennae to scape); *(173)* idem, most distal surviving interval showing poculiform sensillae *(ps)*; *(174)* mandible; *(175)* idem, incisor and molar regions; *(176)* maxilla, smaller setae omitted; *(177)* idem, ultimate article of palp showing possible poculiform sensilla *(ps?)* and thin-walled sensilla *(tws)*. Scale bars = 0.1 mm unless otherwise indicated.

bushes of pectinate macrochaetae as well as many simple setae and four thin setae anteriorly. —Scape of antenna (Fig. 172) quite long with scales over surface and short robust simple anteapical setae, pedicel with two rosettes of setae, first annulus/interval of flagellum with two rosettes of setae (perhaps partially subdivided interval), most distal rosette also with two trichobothria, basal rosette with one trichobothrium, next two intervals with single rosette of setae transversely across the middle of the annulus and two short trichobothria per interval, the following interval with two



Figures 178–188. *Hemitelsella clarksonorum* n.sp. holotype ♂ *(178)* labium, minor seta of palp omitted; *(179)* idem, ultimate article of palp showing location of possible poculiform sensillae *(ps?)*; *(180)* pronotum; *(181)* idem, right posterior trichobothrial area; *(182)* idem, left anterior trichobothrial area; *(183)* idem, left posterior comb; *(184)* mesonotum; *(185)* idem, left anterior trichobothrial area; *(186)* idem, left posterior trichobothrial area; *(187)* metanotum; *(188)* presternum, prothoracic sternum and PI. Scale bars = 0.1 mm.

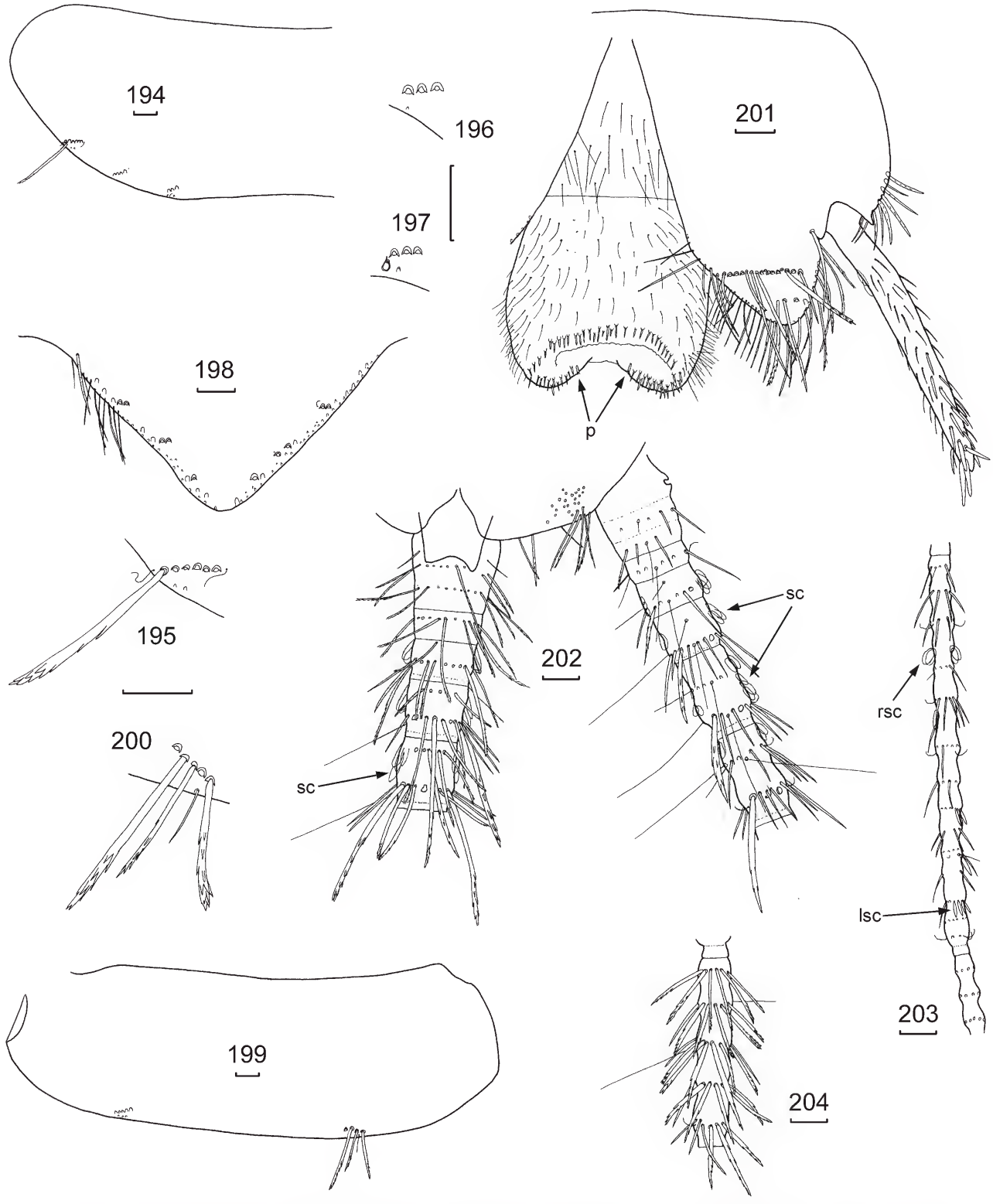
rosettes, the basal with trichobothria, the following intervals beginning to form into annuli and the joints between the annuli are often indistinct incorrectly appearing almost as if there are very long intervals with several rosettes of setae, trichobothria and cilia (Fig. 172). Subsequent intervals with increasing numbers of annuli with three or four rosettes of setae, the most distal with three trichobothria. Intervals with poculiform sensillae from about one quarter the length of the flagellum, initially smaller but becoming larger and apparently more numerous distally. Most distal intervals (Fig. 173) divided into repeated patterns of eight annuli, the most proximal three annuli of each with two poculiform sensillae, the next with none (or perhaps one small), then two then none then two then none; all apparently without rod-like basiconic sensillae. —Mandibles (Figs 174, 175) typical for Ctenolepismatinae with well-developed molar and incisor areas; a group of about fifteen strong and short or thin and longer, apically bifurcated setae distally adjacent to the pectinate molar area and a bush of about 20 macrochaetae externally. —Maxilla (Fig. 176) with some thick apically bifurcate but otherwise smooth macrochaetae externally proximal to the palp, the lacinia with three strong teeth, one



Figures 189–193. *Hemitelsella clarksonorum* n.sp. holotype ♂ *(189)* combs of prosternum; *(190)* mesothoracic sternum and PII; *(191)* combs of mesosternum; *(192)* metathoracic sternum and PIII; *(193)* combs of metasternum. Scale bars = 0.1 mm.

set further back than the other two, followed by about five lamellate processes and a row of eight thin simple setae, galea with several strong, smooth, pointed setae externally in its basal half and a few cilia distally; apical article of maxillary palp (Fig. 177) 3.7 times longer than wide and only slightly longer than the penultimate article, the ultimate article with a rod-like basiconic sensilla and possibly a small poculiform sensillae near it, last three articles of palp with fine setae only, two basal articles with subapical rosettes of slightly thicker setae. —Labium (Fig. 178) wider than long, postmentum with transverse row of smooth apically bifurcate setae, prementum with lateral and oblique groups of strong apically bifurcated setae and with short curved setulae distally; labial palp with subrectangular apical article, not greatly widened medially (Fig. 179), 1.3 times longer than wide with row of eight or nine papillae arranged in a single curved row, possibly with one or two poculiform sensillae as indicated in Fig. 179, one on the outer and one on the inner margin, covered with numerous fine short setae as well as longer fine setae on along the distal end; penultimate article almost as long as the ultimate article.

Thorax. Pronotum (Fig. 180) with narrow setal collar about two macrochaetae wide and some small cilia; lateral margins with many setae (only insertions remain) as well



Figures 194–204. *Hemitelsella clarksonorum* n.sp. holotype ♂ *(194)* urotergite V; *(195)* idem, left lateral comb; *(196)* urotergite II, left sublateral comb; *(197)* idem, left submedial comb; *(198)* urotergite X; *(199)* urosternite III; *(200)* idem, left submedial comb; *(201)* coxite IX with stylus and penis showing location of papillae *(p)*; *(202)* base of cerci and medial filament, showing scales *(sc)*; *(203)* most distal surviving part of cercus showing round *(rsc)* and lanceolate *(lsc)* scales; *(204)* most distal surviving division of median filament (tenth division). Scale bars = 0.1 mm.

as some submarginal setulae, posterior trichobothrium (Fig. 181) at the mediad end of a submarginal comb of three macrochaetae located about ¾ of the distance along the margin of the pronotum (= N), comb N-1 is composed of one or two macrochaetae, comb N-2 (about half way along the margin) is composed of one macrochaeta with the anterior trichobothrium (Fig. 182) located between it and a macrochaeta on the margin. There are three or four more submarginal combs of two to three macrochaetae anterior to the anterior trichobothrial area. Posterior margin with

1+1 single macrochaetae each associated with a marginal seta and a cilium (Fig. 183), the posterior combs being positioned quite laterally and almost contiguous with the chaetotaxy of the lateral margin; the posterior macrochaeta and its insertion not present on right side of holotype. —Mesonotum (Fig. 184) with lateral chaetotaxy similar to pronotum with eight combs of one to three pectinate macrochaetae, the anterior trichobothrial area (Fig. 185) located about two thirds the way along the lateral margin, associated with comb N-2 of just one macrochaeta with the trichobothrium located between the macrochaeta and the margin and with a cilium between the trichobothrium and the seta on the margin. Posterior trichobothrial area (Fig. 186) slightly more posterior than that on the pronotum, the trichobothrium located mediad to a group of three macrochaetae (= N) arranged in a triangle not in a line, (this unusual arrangement occurs on both sides of the mesonotum only; without more specimens it is not possible to say whether this is a characteristic of the species or just an aberrant individual). Posterior margin with quite laterad 1+1 combs each of a single macrochaeta with a cilium at the outer end and a marginal seta. —Metanotum (Fig. 187) similar to mesonotum but with only seven combs of one or two macrochaetae, the anterior trichobothrial area associated with the comb (N-1) of just one macrochaeta about two thirds the distance along the margin, the posterior trichobothrial area associated with the most posterior comb (N) of two macrochaetae and the posterior 1+1 combs again quite laterad with one or two macrochaetae, a laterad cilium and a marginal seta.

Presternum narrow, with transverse row of strong pectinate macrochaetae (Fig. 188). All thoracic sterna with hyaline scales. —Prothoracic sternum (Figs 188, 189) wider at base than long, subtriangular, rounded posteriorly, anterolateral corners with fringe of fine simple setae, posterior three quarters of lateral margins with long fine simple setae as well as 3+3 combs of five to seven pectinate macrochaetae. —Mesosternum (Figs 190, 191) slightly wider than and about one and a half times longer than the prosternum, about as long as wide at its base, with long, thin simple marginal setae and 2+3 combs in its distal third, composed of three to eight shorter and longer pectinate macrochaetae. —Metasternum (Fig. 192, 193) apically rounded, about 1.2 times wider than long with long marginal setae and cilia along distal ¼ of lateral margins and 2+2 combs of longer and shorter pectinate macrochaetae.

Legs (Figs 188, 190, 192) becoming progressively longer and more slender, tibia L/W ratio of legs PI 2.65, PII 3.3, PIII 4.2; tarsi L/W ratio PI 4.9, PII 7.4, PIII 10.7. PI (Fig. 188) with comb of five macrochaetae laterally on precoxa. Coxa with scales and a comb of about six macrochaetae on the anterolateral corners followed by many strong pectinate macrochaetae along the external margin, sometimes grouped into combs of two macrochaetae, the more marginal macrochaetae being much less pectinate, curved carrot-shaped; inner margin with two setae and a long thin seta on the dorsal face and about five setae of varying thickness distally over the articulation. Femur ventrally with several strong, thick pectinate macrochaetae and dorsally with three pectinate macrochaetae over the articulation in addition to fine setae scattered over the mediad half of the dorsal surface. Tibia of PI with numerous long carrot-shaped, slightly pectinate macrochaetae along most of the ventral margin and several shorter stout, apically round setae in the distal half, not forming a row parallel to the margin; external margin with group of stout setae about half the distance along the margin; apex of tibia with two stout pectinate macrochaetae and the usual apical spur which has one stout, round-tipped seta as well as a few small denticulations on the posterior margin. Tarsi of four articles, the basal tarsal article of PI about 40% of the total length of the tarsus, its join with the next article not particularly oblique, the ventral face of all tarsal articles with apically rounded, stout setae which are longer near the apex of each article, dorsally with some simple setae. Pretarsus with two long curved lateral claws and a much shorter curved medial claw. PII (Fig. 190) and PIII (Fig. 192) similar to PI except lacking the anterolateral comb on the coxae; legs progressively longer from anterior to posterior with the tibia of PII being 1.5 times longer than that of PI and the tibia of PIII being 2.15 times longer than that of PI, the relative length of the basal tarsal article is progressively longer, being about 60% of the total length on PIII.

Abdomen. Urotergite I with 1+1 lateral combs of three macrochaetae each comb associated with one or two marginal setae and a cilium at the laterad end of the comb, urotergites II–VII (Figs 194–197) with 3+3 combs of macrochaetae as in Table 3, the lateral combs with pectinate macrochaetae (all lost in other combs) also associated with 2–3 marginal setae or setulae and one or two cilia, almost always at the laterad end of the comb but often at both ends, the sublateral combs usually associated with 0–2 marginal setae or setulae (all lost) and occasionally a cilium at the mediad end, the submedial combs associated with 0–1 marginal setae or setulae and with a cilium at the laterad end of the comb; urotergite VIII with 2+2 combs, lacking the sublateral comb; urotergite IX glabrous. Urotergite X (Fig. 198) subtriangular with rounded apex, wider than long (L/W at base about 0.50) with many fine setae along entire margin as well as some stronger weakly pectinate setae close to the margins; with 3+3 combs of one or two macrochaetae per comb (all macrochaetae lost) with rare setulae posterior to the combs.

Urosternite I and II glabrous, urosternites III–VIII with 1+1 lateral combs of five to nine pectinate macrochaetae (Figs 199, 200) each usually associated with one to five thin marginal setae or setulae and rarely a cilium at the laterad

Table 3. *Hemitelsella clarksonorum* n.sp. number of macrochaetae per bristle comb.

Segment	Urotergite			Urosternite
	Lateral	Sublateral	Submedial	
I	3	—	—	—
II	3	2–3	2–3	—
III	3–4	3	2	5
IV	4	3	2	6
V	5–6	3–4	2–3	6
VI	6	4	3	6–8
VII	6	4	2	8–9
VIII	6–7	—	3	8–9
IX	—	—	—	—

end of the comb (only segments VII and VIII). The distance between the lateral combs 4–11 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Each coxite IX (Fig. 201) with obvious transverse comb of sixteen macrochaetae across the inner process and four macrochaetae on the face posterior to the transverse comb; the internal process not acute nor elongated, about four times longer than the external process but only about two thirds as long as broad at its base; external and internal margins of internal process and external margin of outer process with many long, thin, often pectinate setae arising mostly from the dorsal face of the margin. Outer process small, acute triangular with a few setae along the outer margin. Only one pair of long slender styli (Fig. 201) present (IX); each stylus with about two short robust round-tipped macrochaetae apically. Styli IX in male holotype (excluding the apical macrochaetae) about three times the length of the internal process. Penis typical (Fig. 201) with numerous glandular setae apically, each set on a protuberance; with small three- or four-armed papillae located on either side of opening. Parameres absent.

Cerci (Figs 202, 203) with five basal divisions shorter than wide then progressively longer with setae, macrochaetae and trichobothria becoming increasingly stronger and longer distally until the eleventh when the long trichobothria are no longer visible and the remaining macrochaetae are shorter; most macrochaetae on the cerci are simple not pectinate except for one mediad and subapical on each division; divisions from about the seventh with two rosettes and three annuli; the number of these annuli increases progressively (seven in the tenth, eleven in the thirteenth and fifteen in the fifteenth) with setae and scales (both lanceolate and wider) at various locations as shown in Fig. 203. —Median dorsal appendage (Figs 202, 204) with long first division bearing 1+1 small setae and two further rosettes of small setae and trichobothria, the setae above simple while those below are very pectinate, following divisions also short with setae and trichobothria in increasing numbers, scales visible at sides on the surfaces proximad to each rosette from the fifth division becoming less numerous and conspicuous distally, divisions begin to form into annuli by about the sixth division, having about five annuli by the tenth and eleventh divisions (most distal surviving divisions) (Fig. 204).

Female. Unknown.

Habitat. As for *Acrotelsella parlevar* with which it was collected in a single pitfall trap in an area described as dry sclerophyll forest dominated by *Eucalyptus viminalis*, *E. amygdalina* and *Exocarpos cupressiformis* with a grassy understorey (*Poa* and *Themeda*). The soil was very rocky. Ants of the genera *Iridomyrmex* and *Melophorus* were also found in the pitfall trap but no association is suspected.

Etymology. The species is named for the collectors of the species, Wade and Lisa Clarkson.

Remarks. The only other species yet described of this genus is *Hemitelsella transpectinata* (Smith) from Barrow Island. Superficially there seems to be very little in common regarding the habitat of these two species with Barrow Island being extremely hot and arid most of the time, while the Tasmanian site is cool and temperate. The single Tasmanian specimen and all 170 specimens from Barrow Island were collected in pitfall traps, suggesting the species is quite mobile living in leaf litter, under stones or cracks within the soil.

Discussion

The Tasmanian silverfish fauna appears to be more diverse than expected for a cooler temperate climate. While *Australiatelura* and *Heterolepisma* species are well represented in the south eastern mainland fauna and not unexpected in Tasmania, the presence of *Acrotelsella* and *Hemitelsella*, genera previously only associated with warmer to hotter and usually drier climates, suggests that our knowledge of the Australian fauna is far from adequate. With further collecting efforts, using a variety of collecting techniques, it is quite likely that more species will be found in both Tasmania and the many uncollected parts of mainland Australia.

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